Appendix 3—Project Delivery

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1. INTRODUCTION

1.1. Document Overview

This document describes the **Project** delivery requirements that must be executed during the design, development, installation, and maintenance of the **Toll Collection System (TCS)** that **WSDOT** desires to procure for the **SR 520 Bridge**. This document is divided into five major sections. Section 1 explains the scope of the document as a whole. Section 2 provides an overview of the Project management requirements of the TCS. Section 3 details the requirements which apply to the design and development phase of the TCS. Section 4 details the requirements that apply to the **System** installation and integration of the infrastructure and components that will make up the TCS. Section 5 details the testing requirements and outlines the process of **System Acceptance**.

1.2. Abbreviations and Definitions

All capitalized terms and abbreviations used in this Appendix 3, but not expressly defined herein, have the respective meanings set forth in **Appendix 1 -- Definitions**, attached to the **RFP**.

2. PROJECT MANAGEMENT

The **Vendor** shall perform in a manner consistent with the goals and direction of WSDOT and the requirements of this Request For Proposals (RFP). The primary management goals are to provide the public with a Project that meets the requirements of this RFP and is completed on time and at a fair cost, with as little impact on the environment as possible.

The Vendor shall maintain open and continuous communications with WSDOT, and the two parties shall continually look opportunities to improve efficiency while at the same time meeting the goals and requirements of this RFP.

The Vendor shall provide Project management throughout the lifecycle of the TCS Project. This Project consists of two segments of Work. During the first Segment of Work, the Vendor shall prepare and deliver, at a minimum, the following Project management documents:

a. Project Management Plan
b. Quality Management Plan
c. Software Development Plan
d. Project Schedule
e. Weekly Status Meeting Agendas and Minutes
f. Monthly Progress Reports
g. **Milestone** Invoices

During the second segment of Work, the Vendor shall prepare and deliver, at a minimum, the following Project management documents:

a. Maintenance Plan
b. Monthly Maintenance Reports
c. Monthly Maintenance Invoices
d. Annual Performance Audit Reports

2.1. Segment of Work #1 Project Management Documents

2.1.1. Project Management Plan

The Vendor shall prepare and submit to WSDOT for approval a Project Management Plan (**PMP**), which shall describe the Vendor's Project team organization and reporting relationships, **Key Project Staff**, team member contact information, Project stakeholders, the Vendor's Project delivery approach, communication plan, Project risks, and the Vendor's procedures for managing and controlling the overall **Work**. The PMP shall be updated at least annually unless otherwise agreed to in writing by WSDOT.

2.1.1.1. Project Organization

As part of the PMP, the Vendor shall include a Project Organization Chart, a graphic representation of the Vendor's Project team organization and hierarchy that indicates functional areas of responsibility for the Key Project Staff.

2.1.1.2. Key Project Staff

As part of the PMP, the Vendor shall include a summary of individuals designated as Key Project Staff. WSDOT shall review and provide the Vendor written approval prior to the start of Work of any individual listed as Key Project Staff who was not included within the **Proposal**.

The Vendor shall also submit a Key Project Staff directory that includes the following information:

a. Name
b. Title (with respect to the Work)
c. Office address
d. E-mail address
e. Office telephone numbers
f. Fax number
g. Mobile phone number

The directory shall be updated throughout the course of the Work.

Key Project Staff are the individuals from the Vendor's organization who are functionally responsible for each of the following roles:

a. Project Manager
b. Deputy Project Manager
c. Software Design Manager
d. System Test Manager
e. Maintenance Manager
f. Quality Assurance Manager
g. Environmental Compliance Manager
h. Traffic Control Supervisor

The Vendor shall be required to notify WSDOT at least thirty (30) **Calendar Days** in advance of replacing any Key Project Staff and shall submit the names and Qualifications of the proposed replacement(s) to WSDOT for written approval. WSDOT shall be

allowed to interview replacements, if WSDOT so desires. WSDOT shall have the right to reject, at its sole discretion, any proposed replacement.

The Vendor shall provide an escalation list to WSDOT including Key Project Staff who may be contacted to respond to actual or imminent hazards. When the Vendor is notified of a hazard to the public or critical infrastructure related to the **Products** and **Services**, the Vendor shall respond immediately and a Vendor representative shall be onsite within forty-five (45) minutes.

2.1.1.3. Project Delivery Approach

The Vendor shall include language within the PMP describing the Vendor's approach to deliver a System that meets the functional, operational, and performance requirements.

2.1.2. Quality Management Plan

The Vendor shall prepare, submit to WSDOT for approval, and adhere to a Quality Management Plan that details the scope, requirements, criteria, processes, and procedures necessary to deliver a quality project satisfying all requirements of this RFP.

Vendor shall maintain its own internal Quality Management staff, so that such individuals have the authority to effect changes in design, construction, and/or maintenance procedures, as the case may be, in the event of any failure to comply with the stated requirements of this RFP.

Vendor may use subcontracted Services for the Quality Management role. The Quality Management of the Work shall ensure that the Work is completed in accordance with the requirements of this RFP, and it shall confirm that Vendor is achieving the obligations and commitments stated in its Proposal.

2.1.3. Software Development Plan

The Vendor shall submit a Software Development Plan (**SDP**) to WSDOT that establishes the framework used for the **Software** development of the TCS. The SDP shall describe the Software life-cycle approach that emphasizes the necessary interfaces between various System development disciplines (i.e., Software Vendors, system engineers, test engineers, etc.).

The SDP shall indicate all elements of the Software development process and shall include, but not be limited to, the following:

a. Software development schedules
b. Software development tools
c. Assignments to **Subcontractors**
d. Programming languages
e. Software development process

f. Software development **Quality Control** and **Quality Assurance**

g. Software testing plan

h. Software documentation plan

i. Software management plan

j. **Configuration Management** plan

The SDP shall also include detailed information on the Technical Approach, problem reporting and tracking process, Software configuration and change management, and other items pertinent to a complete plan for Software development for the Project.

The SDP shall be submitted in accordance with the terms of the **Contract**.

A high-level program of Software testing shall be defined as part of the SDP. The Vendor's testing plan shall include a summary of test procedures, dates, and equipment to be used for each particular test. It shall include a description of documentation to be provided for application programs, as well as incorporating standards to be followed and sample documentation, where available.

2.1.4. Project Schedule

The Vendor shall develop, submit to WSDOT for approval, and maintain a cost-loaded **Critical Path** method Project Schedule utilizing Microsoft Project. The planning, design, installation, and completion of the Work shall be undertaken and completed in accordance with the most recent Project Schedule approved by WSDOT.

The Project Schedule shall mean the initial schedule submitted with the Proposal, the approved baseline schedule, and the most recently approved revised cost-loaded schedule, which has been updated by the most recently approved monthly schedule update, as applicable.

The Project Schedule shall be used by the Vendor and WSDOT for planning and monitoring the progress of the Work.

The Project Schedule shall divide the Work into activities with appropriate logic ties to show the Vendor's overall approach to the planning, scheduling, and execution of the Work. All Work shall be represented by cost-loaded Project activities. The duration and logical relationships of the Project activities (or summaries at phase level) shall be based on the actual duration and relationships anticipated.

No unspecified Milestones, constraints, Project float suppression techniques, or use of Project activity durations, logic ties, and/or sequences deemed unreasonable by WSDOT, shall be used in the Project Schedule. Each Project Schedule submittal shall clearly and individually define the progression of the Work within the applicable time frame by using separate Project activities, including but not limited to:

a. All Work components, including management, administration, and Quality Assurance activities
b. Vendor Milestones
c. Interfaces with external entities pursuing or undertaking work, such as with the civil contractor responsible for installing the WSDOT-provided infrastructure
d. Design submittal requirements and other **Deliverables** (including WSDOT review time)
e. Identification of planned dates of start of installation
f. Material and equipment procurement and delivery to the installation sites or storage locations
g. Maintenance of traffic activities

The Vendor shall allocate the total applicable **Price** and commodity quantities throughout the Project activities in the Project Schedule. Such allocation shall accurately reflect the Vendor's cost for each Project activity and shall not artificially inflate, imbalance, or front-load line items. A Price for each Project activity shall be all-inclusive and shall include all direct and indirect costs, overhead, risks, and profit. Note that cost information shall be suppressed on the Proposal submittal, but shall be included with the Vendor's first monthly progress report, as outlined in **Section 2.1.5.2** - Monthly Progress Reports, and submitted with Vendor's first invoice.

Seasonal weather conditions shall be considered and included in the planning and scheduling of all Work to ensure completion of all Work within the Contract time.

Vendor shall use standard and consistent Project activity identification numbers, textual descriptions, and codes in all Project Schedule submittals, in a manner acceptable to WSDOT. Each Project Schedule submittal shall be clearly identified.

2.1.4.1. Initial Schedule

The initial Project Schedule shall show, in detail, the Vendor's Work activities for the entire Project. The initial Project Schedule shall be updated on a monthly basis and included within the monthly Progress Report.

2.1.4.2. Schedule Updates

As it becomes necessary to modify the Project Schedule to reflect changes to the Work sequences, the Vendor shall submit proposed changes to the Project Schedule for WSDOT approval.

No changes to the Project Schedule shall be made without the approval of WSDOT. Until WSDOT approves a change, all Project Schedule submittals shall be tracked against the

previously approved Project Schedule baseline. Accepted revisions shall be incorporated into the Project Schedule in the next monthly Progress Report.

Revised Project Schedule submittals shall include a comprehensive listing of all Project activities added or deleted along with a complete listing of all logic and Project activity changes.

Once a revised Project Schedule is approved by WSDOT, it shall become the Project Schedule of record, a baseline shall be created, and it shall be used as the basis for the next monthly Progress Report.

An electronic copy of the Project Schedule file used for the monthly Progress Reports shall be submitted to WSDOT with the monthly Progress Reports.

2.1.4.3. Four-week Look-Ahead

The Vendor shall provide on a bi-weekly basis a day-by-day four (4)-week look-ahead schedule with a focus on the need for WSDOT coordination.

2.1.5. Progress Reporting

The Vendor shall be responsible for disseminating information through weekly status meetings and monthly Progress Reports throughout the Project.

2.1.5.1. Weekly Status Meetings

Vendor shall meet with WSDOT either in person or by telephone weekly during periods when Work is underway through System Acceptance.

In addition to the weekly meetings, Vendor shall meet with WSDOT or its designee as needed to discuss Project-related or long-term strategy issues. These meetings shall be held to discuss Work progress, outstanding issues, and planned Work. The Vendor and WSDOT shall jointly develop the agenda for these meetings; however the Vendor shall be responsible for the distribution of the agenda to the attendees at least twenty-four (24) hours prior to each meeting. The Vendor and WSDOT shall find a mutually agreeable location for these meetings.

The Vendor shall keep minutes of all Project-related meetings and distribute copies of the draft minutes to WSDOT participants within five (5) **Business Days** after the meeting date, and final meeting minutes five (5) Business Days after WSDOT has submitted draft meeting minute comments. The comment period shall be open for at least five (5) Business Days following the distribution of the meeting minutes.

The Vendor shall be responsible for the distribution of final WSDOT-approved meeting minutes to appropriate parties.

At a minimum, all meeting minutes shall contain a complete list of attendees (including their affiliations, e-mail addresses, and telephone numbers), descriptions of issues discussed, any decisions made, direction given, remaining open issues, and action items (including identification of the party responsible for follow up and the target date for resolution).

Internal meetings between the Vendor's team members are excluded from this requirement.

2.1.5.2. Monthly Progress Reports

Commencing in the first full month after issuance of **Notice to Proceed** and every month thereafter through System Acceptance, the Vendor shall submit a monthly Progress Report for WSDOT's review. The monthly Progress Report shall include the currently approved Project Schedule.

The monthly Progress Reports shall minimally include the following:

a. Progress for the current period (previous month) for all Project activities including all agendas and minutes from the month's weekly status meetings

b. Actual start and actual finish dates of Work, percentage complete, and days remaining for Work in progress

c. All potential delays and problems, and their estimated affect on the Project Schedule and overall completion

d. Plans for the next reporting period

e. Submittals scheduled to be submitted for the next reporting period

f. Critical items graphical report for each Critical Path sorted by activity start date

g. An electronic copy of the current Project Schedule

WSDOT shall review the monthly Progress Reports for consistency with the Vendor's current approved Project Schedule and for conformance with this RFP. The Vendor shall correct any deficiencies and resubmit deficient monthly Progress Reports. WSDOT shall withhold payments from the Vendor until the monthly Progress Report changes have been made to the satisfaction of WSDOT.

The monthly Progress Reports shall reflect updated progress to the status date, forecast finish dates for Project activities in progress, and forecast dates for remaining Project activities. It shall otherwise contain no changes in Project activity durations, logic ties, or restraints without approval from WSDOT. It shall also incorporate and fully specify all appropriate information from prior-approved Project Schedules.

2.1.6. Milestone Invoices

The Vendor shall invoice WSDOT in accordance with the Milestone payments schedule, for Milestones achieved, but not more than once per month. Payment requests shall be accompanied by the monthly Progress Report(s), any required Deliverables, backup tabulations, and proof of progress.

2.2. Segment of Work #2 Project Management Documents

2.2.1. Maintenance Plan

The Vendor shall prepare and provide WSDOT with a proposed written standard Maintenance Plan with which the Vendor and its employees and agents shall strictly comply. The Maintenance Plan shall include details of how maintenance activities will be performed including a plan for preventive maintenance. The Maintenance Plan shall also include a plan for inventory management and control, including all activities required to maintain adequate supply of materials, supplies, spares, parts and equipment to maintain the System at all times.

The Maintenance Plan shall be submitted to and approved by WSDOT prior to System Acceptance. Neither the acceptance of the Maintenance Plan nor any direction of changes to the Maintenance Plan shall shift any liability or risk to WSDOT for maintenance of the System or Vendor's obligations to comply with the Performance Requirements and the other requirements of the Contract. Any changes to the Maintenance Plan approved by WSDOT, in its sole discretion, shall be documented by changes to the Maintenance Plan.

2.2.2. Monthly Maintenance Reports

Commencing in the first full month after issuance of System Acceptance, the Vendor shall submit a Monthly Maintenance Report for WSDOT's review. The Monthly Maintenance Reports shall include, but not be limited to the following data:

a. Progress for the current period (previous month) for all Project activities
b. **MTTRespond** and **MTTRepair** data and calculations including exceptions and justification
c. Monthly **Performance Measures** and any ad hoc verifications performed that month
d. **Work Orders** including the technician(s) that worked on the issue and associated Key Project Staff/repair times
e. Lane closure information and associated rental fees

WSDOT shall review the Monthly Maintenance Report for conformance with this RFP. The Vendor shall correct any deficiencies and resubmit the Monthly Maintenance Reports. WSDOT shall withhold payments from the Vendor until the Monthly Maintenance Report changes have been made to the satisfaction of WSDOT.

WSDOT reserves the right to review the maintenance records and database files for compliance with System performance requirements.

2.2.3. Monthly Maintenance Invoices

The Vendor shall invoice WSDOT monthly for maintenance operations for the previous month. Payment requests shall be accompanied by the Monthly Maintenance Report.

2.2.4. Annual Performance Audit Reports

An annual Performance Audit shall be completed within thirty (30) Calendar Days of each anniversary of System Acceptance. The Vendor shall contract with a WSDOT-approved third-party to attest to the Vendor's assertions on compliance with the TCS Performance Measures in the Contract.

The Vendor shall submit a Performance Audit Report for WSDOT's review within thirty (30) Calendar Days of completion of the annual Performance Audit. The Performance Audit Report shall include a summary of the test activities and general conclusions of the test results. A detailed description of the test activities and results including any discrepancies and corrective action taken shall be included as an attachment.

Once WSDOT approves the annual Performance Audit Report, the Vendor shall include a request for payment in the amount set forth in the Contract for the Performance Audit with the next monthly maintenance invoice submittal.

2.3. Documentation

Vendor shall maintain at all times at Vendor's office, at a minimum, one (1) complete set of all documentation and Deliverables including, but not limited to:

a. Design and construction/installation contracts and subcontracts;
b. Calculations;
c. Reports;
d. Studies and investigations;
e. Materials testing results
f. Plans;
g. Communications;
h. Minutes of meetings;
i. Review comments;
j. Governmental approvals;
k. Change orders and claims; and
l. Insurance policies, correspondence, and terms.
m. System Design Documents
n. Test Plan

o. Testing procedures and results

p. Software source code

As a condition of System Acceptance for the System, Vendor shall deliver one electronic copy of such documents to WSDOT for its retention and use at the completion of the Project.

Organization of electronic files and file format shall be acceptable to WSDOT.

3. DESIGN AND DEVELOPMENT

WSDOT envisions a collaborative approach to the design process. The Vendor shall fully participate in this collaborative process by providing the creativity, industry knowledge, and professionalism needed to develop the System design.

The Vendor shall recognize WSDOT's ownership of the completed System, and strive to foster cooperative design process whereby WSDOT's comments, concerns, and input are acknowledged and responded to in a mutually agreed fashion. WSDOT staff will be available to the Vendor to answer questions and provide clarification to WSDOT comments and concerns.

In order to foster a collaborative development environment, the Vendor shall provide WSDOT with contact information for the Vendor's lead System developers, and include the developers in System design workshops and comment resolution meetings.

3.1. Kickoff Meeting

The Vendor shall facilitate a kickoff meeting with WSDOT within one (1) week of receiving the Notice to Proceed.

The kickoff meeting agenda shall include a review of the Project budget, schedule, and scope, and identification of any documents or materials that the Vendor needs from WSDOT.

The kickoff meeting shall be held in the King County, Washington, area at a location arranged by WSDOT.

3.2. Design Workshops

The Vendor shall conduct up to three (3) System design workshops with WSDOT, each lasting up to three (3) Business Days each. The list of attendees shall include, but not be limited to, representatives of the following groups within WSDOT:

a. TCS Project Staff
b. WSDOT Tolling Division
c. NW Region
d. Headquarters (Executive, Operations, Maintenance, Communications, and Information Technology)

At the initial design workshop, the Vendor and WSDOT shall discuss how each System functional requirement should be addressed in the design (requirements walk through), using the Vendor's Proposal as a starting point.

At the discretion of the Vendor, the Vendor may opt to organize several separate workshop sessions to be conducted in parallel, such as separate sessions for Software, **Hardware**, communications, etc.

The outcome of the design workshop shall be a series of annotated, high-level concept and detailed data flow diagrams that capture the design consensus reached at the workshops.

The Vendor shall submit draft annotated, high-level concept and detailed data flow diagrams to WSDOT for review and approval. The Vendor shall respond in writing to all WSDOT written comments.

The Vendor shall conduct at least one (1) follow up System design workshop with WSDOT, lasting up to three (3) Business Days. The purpose of the workshop is to verify the Vendor System design, interface, and reports meet all applicable requirements and comments provided during the initial System design workshops. The list of attendees shall be determined by WSDOT and shall include key staff that participated during the initial System design workshops. The meeting minutes for these workshops shall be submitted to WSDOT for review and approval.

3.3. System Design

3.3.1. Preliminary Design Review

After the design workshops have taken place and the Vendor has incorporated the workshops into the System design, the Vendor shall prepare a Preliminary Design Document (**PDD**) and conduct a Preliminary Design Review (**PDR**). The PDR shall be a formal presentation to WSDOT covering detailed information on schedule, organization, Technical Approach, methodology, and other issues related to a complete plan for design and development of the Software and Hardware. The time and location of the PDR shall be mutually agreed to by WSDOT and the Vendor based on the progress of the design workshops.

Sections for the PDD and topics for the PDR shall include, but shall not necessarily be limited to, the following:

a. Team organization;
b. TCS methodology;
c. TCS Schedule;
d. Overall System architecture;
e. Requirements for each System or sub-system;
f. Project Management Plan, Quality Management Plan, Software Development Plan overview;
g. Installation Work overview;
h. Assess design issues and associated risk;
i. Risk mitigation; and
j. Environmental considerations.

In addition, the Vendor shall address and show compliance with Quality Assurance, reliability, maintainability, Software development and other System requirements. Hardware concept drawings and preliminary level engineering specifications shall be submitted during this review.

The PDR documentation shall include detailed information on schedule, organization, Technical Approach, methodology, risk mitigation, and other issues related to a complete plan for development.

3.3.2. System Design Document

From the feedback received during both the design workshops and the PDR, the Vendor shall provide a System Design Document (**SDD**) consisting of Software design, Hardware design, Systems Requirement Compliance Matrix, Bill of Materials, and Systems Engineering Process Documentation.

Prior to submitting the draft SDD, the Vendor shall first prepare a detailed document outline. The SDD outline shall include four sub-levels of detail and a brief description of the information included in each section. At WSDOT's discretion, the Vendor and WSDOT shall meet to discuss WSDOT's comments on the SDD outline and revise the outline accordingly to meet WSDOT's requirements for detail. The detailed outline shall be submitted to WSDOT for review and approval.

The SDD shall include a description of the System and its constraints, as well as the conceptual design for the overall System and subsystems including Software, Hardware, equipment, and communications.

The Vendor shall provide a functional narrative of the System and subsystem block diagrams, data flow diagrams, data structure diagrams, schematics, report layouts, graphic user interfaces, and any other graphic illustrations to demonstrate the technical adequacy of the System design approach and compliance for System Hardware and Software with Quality Assurance, reliability, maintainability, Software development, and other requirements set forth in this RFP.

The SDD shall include at least the following information:

a. Description of the System and constraints
b. Functional Specifications for the System and the sub-systems
c. Discussion of any design variants and selection of design
d. Block diagrams for the System and sub-systems
e. Descriptions of the System and sub-systems
f. Listing of reports
g. User task flow
h. User interfaces
i. Interfaces for all Software modules
j. Interfaces to **CSC**
k. Hardware and equipment design

l. Communication network design

m. Assessment of risks and risk mitigation strategies

The Vendor shall write the SDD to the level of technical detail that will enable the developers to code and build the System. The SDD shall not be written in the tone and format of a user's manual.

The Vendor shall deliver several versions of the SDD including draft, final, and as-built. The Vendor shall ensure that all submitted documents have been subject to internal editorial review and are professionally presented and substantially free of grammatical, formatting and content errors. An abundance of such errors may result in WSDOT's rejection of the submittal. The Vendor shall formally submit each iteration of the SDD to WSDOT. Interim, electronic, or piecemeal submittals shall not be accepted.

WSDOT will review and comment on each SDD submittal within the time frame set in the Contract. The Vendor shall then be required to respond to each comment, either to state what System changes will be made in Key Project Staff to the comment, or to state that no changes will be made. If no changes are to be made, the Vendor shall state the reason for this decision.

WSDOT may choose to reject, in whole or in part, a document submittal if it is noncompliant with WSDOT's requirements. Rejection of a submittal by WSDOT shall not release the Vendor from responding to WSDOT's comments.

Comment resolution meetings will be held with WSDOT and the Vendor to review the Vendor's Key Project Staffs to the draft and draft final SDD. The Vendor shall not resubmit the document until the comment resolution meeting has been held.

The draft final and final SDD shall include, in an appendix, a matrix of WSDOT's comments, the Vendor's Key Project Staff, and a description of how the comment is reflected in the revised document.

The next iteration of the SDD shall include an appendix of the comments received from WSDOT, the Vendor's Key Project Staff (including any changes to the Key Project Staffs as a product of the comment resolution meeting) and a description of the resultant System design changes that are documented in the revised SDD.

The SDD will be used as the baseline document to determine if the System meets WSDOT's requirements.

3.3.2.1. Software Design

The Software design portion of the SDD shall consist of a schematic of the System database, including a description of all fields in all tables.

All text and illustrations shall be of the System that is being designed for WSDOT to meet WSDOT's requirements.

The Software design shall include a System architecture chapter with detailed process flow diagrams for each subsystem, and accompanying test describing each process flow.

The process flow diagrams shall be a full, complete, and accurate representation of the System as it is designed.

The Software design shall include examples of all reports.

Sample reports shall display test data that is reasonably representative of the data that will be displayed in live operations.

A data field description table that defines each field displayed in the report and maps the field back to the database shall accompany each sample report.

Additionally, the Software design shall consist of the Software specification as discussed below.

3.3.2.1.1. Software Specification

The Vendor shall prepare a detailed Software specification that includes a description of all programs and subroutines satisfying all functional requirements, as set forth in the Contract.

Flow diagrams shall be included in the Software specification for programs used in all subsystems to clearly identify data flow through the System and to illustrate the relationship between individual programs and/or subroutines.

A preliminary data dictionary and file/record document shall also be included in the Software specification. This document shall define all data messages, records and files accessed by more than one program in the TCS.

3.3.2.2. Hardware Design

The Hardware design portion of the SDD shall consist of the lane layout diagrams that depict, at a high level, the planned locations for all field devices and related equipment (i.e. communications, cabinets, etc.).

The Hardware design shall include specification cut sheets for all equipment, including off-the-shelf equipment procured from another Vendor.

The Hardware design shall include diagrams illustrating the communications and power connections required for each device.

3.3.2.3. System Requirements Compliance Matrix

The Vendor shall create a System Requirements Compliance Matrix that shall show how each System requirement is being met by the System design.

The Vendor shall present the System Requirements Compliance Matrix template to WSDOT for its review and approval.

3.3.2.4. Bill of Materials

The Vendor shall provide a preliminary Bill of Materials to WSDOT with the SDD. The Vendor shall update the Bill of Materials at the conclusion of the installation process.

The final Bill of Materials document shall provide a comprehensive list of the components built and installed as part of the System.

3.3.2.5. Systems Engineering Process Documentation

The Vendor shall ensure that the design and implementation of the Project conforms to the Systems Engineering Process, as described in WSDOT *Design Manual* Supplement, *Engineering for Intelligent Transportation Systems* dated X.

The Vendor shall document conformance of its design and implementation efforts with the Systems Engineering Process. The Vendor shall also separately assist WSDOT in documenting the overall System Engineering Process to FHWA.

3.4. Structural Design Elements

3.4.1. Personnel Requirements

The Vendor shall provide a Structural Lead Engineer with a minimum of ten (10) years of experience in the design and construction of bridges, retaining walls, and other highway-related structures. The Structural Lead Engineer shall be a Structural Engineer licensed under Title 18 **RCW**, and shall be in responsible charge of the structural design elements of the Project.

3.4.2. Design Criteria

A minimum vertical clearance of nineteen (19) feet shall be maintained over all roadways at all times during and after construction.

All existing structural elements whose load-carrying capacities are altered by the Work shall be analyzed and designed using the current version of the then WSDOT Bridge Design Manual.

3.4.2.1. Overhead Mounting

The Vendor shall design and construct all associated mounting materials and brackets to install the Products.

The Products mounting materials shall be designed to withstand a wind velocity of 100 mph with a 30% gust factor, and shall otherwise comply with the latest requirements of **AASHTO** Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals.

All overhead equipment shall be designed for quick installation and replacement and to ensure that equipment or tools will not fall onto the roadway below the gantry during maintenance or when subjected to environmental conditions found in the **State** such as ice, snow, or wind.

All Products and associated cabling shall be designed to function in all environmental conditions found in the State.

3.4.2.2. Conduit

Conduit mounted to structures shall be mounted in areas where visual impacts will be minimized. Acceptable locations shall include the area between girders or on the underside of the deck, in the shadow cast by the deck overhang.

3.4.3. Installation Drawings

The Vendor shall prepare and submit to WSDOT for approval of draft, final, and As-Built installation drawings detailing the physical components of the approved System design in both the roadway and at WSDOT's **Traffic Management Center (TMC)**.

The Vendor shall adhere to the then current version of the WSDOT *Plans Preparation Manual* (M22-31) for the preparation of all drawings.

A Washington State registered Professional Engineer licensed under Title 18 RCW shall sign all drawings for any field installation Work.

Final installation drawings shall include details and calculations of all structural components, drawings of conduit layouts, pull boxes, splice enclosures, cable diagrams, wiring lists, cabinet layouts, wiring diagrams, schematics of communication system, outstation equipment, and outstation equipment cabinets.

3.4.4. Shop Drawings

Prior to fabrication, the Vendor shall prepare and submit shop drawings for the tolling equipment mounting brackets to WSDOT for review and comment. A Washington State registered and licensed Structural Engineer in accordance with Title 18 RCW shall design the tolling equipment mounting brackets.

3.5. Infrastructure Requirements

The Vendor shall submit to WSDOT a **RTCS** Infrastructure Requirements document that details the Vendor's requirements for the WSDOT-provided infrastructure identified in Appendix 2, Section 10.1. The RTCS Infrastructure Requirements document shall specify type, size, location, quantity, and any other relevant specifications for the following:

a. **Roadside System** Cabinet
b. Conduits
c. Electrical Service
d. Emergency Generator and Transfer Switch
e. Electrical and Data Conductors (from the Roadside System Cabinet to the **Demarcation Point**)
f. Roadside Maintenance Pullout

Vendor shall submit the RTCS Infrastructure Requirements document one hundred twenty (120) Calendar Days prior to the date when Vendor needs the WSDOT-provided infrastructure completed.

4. SYSTEM INSTALLATION AND INTEGRATION

The installation requirements for the TCS are defined in this section.

Unless accepted in writing by WSDOT, no System installations shall occur prior to the satisfactory completion of the **Factory Acceptance Test (FAT)**.

4.1. Installation Plan

The Vendor shall submit an Installation Plan, to include an installation checklist, identifying the approach for installation and covering the major elements of the installation for each phase of the Project. The Installation Plan shall also include all applicable **FCC** Licenses required for the TCS.

The Installation Plan will be the master document from which the elements of the System will be installed. The Installation Plan shall include and define, at a minimum, the following items:

a. The proposed installation schedule detailing installation activities for all phases of the Project.

b. The resource allocation (personnel and equipment) requirement for any installation phase.

c. Coordination with WSDOT to maximize on lane closures and minimize traffic delays.

d. Managing delivery and staging of the TCS.

e. The order that the TCS equipment items are to be installed and the estimated durations of installation.

f. Details regarding the lightning and surge suppression system.

g. Any special or unique installation requirement.

h. Requirements for lane closures or other maintenance or traffic requirements.

i. A detailed component list and how each item will be documented for equipment Configuration Management. At a minimum, the Vendor shall document the part number, model number, version, and serial number.

4.1.1. Installation Checklist

As part of the Installation Plan, the Vendor shall develop an installation checklist defining the staging, sequence of installation, testing, and integration for the TCS.

The checklist shall be a document detailing those items required for the installation crew to complete the installation process. A completed copy of the checklist shall be provided to WSDOT after the installation activity for each direction of the TCS.

Construction operations shall be conducted in a manner and sequence that assures the least interference with traffic, with due regard to the location of detours and provisions for handling traffic.

4.1.2. FCC Licensing

The Vendor shall assist WSDOT radio staff in securing all required FCC licenses prior to installation by providing information required for the FCC application such as frequencies, location information, and other related information.

WSDOT shall own the FCC license for all tolling equipment required to have one.

4.2. Maintenance of Traffic (MOT)

The Vendor shall conduct all Work necessary to meet the requirements associated with Maintenance of Traffic (**MOT**), including providing for the safe and efficient movement of people, goods, and services through and around the Project, while minimizing negative impacts to residents, commuters, and businesses.

The Vendor shall prepare a Traffic Management Plan (**TMP**), a Traffic Incident Management Plan (**TIMP**), and MOT Plans, and shall conduct all on-site activities relating to traffic maintenance in accordance with this section.

4.2.1. Conformance to Established Standards

Flagging, signs, and all other traffic control devices and procedures provided by the Vendor shall conform to the standards established in the **FHWA MUTCD** adopted by WSDOT, the Washington State MUTCD, and the FHWA Final Rule - 23 **CFR** Part 630. The quality of devices provided shall be based on the American Traffic Safety Services Association (ATSSA) *Quality Guidelines for Work Zone Traffic Control Devices*. Copies of the FHWA MUTCD and the ATSSA *Quality Guidelines for Work Zone Traffic Control Devices* may be purchased from the ATSSA, 15 Riverside Parkway, Suite 100, Fredricksburg, Virginia, 22406-1022. The *Washington State Modifications to the MUTCD* may be obtained from the Department of Transportation, Olympia, Washington 98504.

In addition to the standards of the Washington State and FHWA MUTCDs described above, WSDOT has scheduled the implementation of crashworthiness requirements for most Work zone devices. The **NCHRP** Report 350 has established requirements for crash testing. Work zone devices are divided into four categories. Each of those categories and, where applicable, the schedule for implementation is described below:

a. Category 1 includes those items that are small and lightweight, channelizing, and delineating that have been in common use for many years and are known to be crashworthy through testing of similar devices, or years of demonstrable safe performance. These devices include cones, tubular markers, flexible delineator posts, and plastic

drums. All Category 1 devices used on the Project shall meet the requirements of the NCHRP Report 350 as certified by the manufacturers of the devices.

b. Category 2 includes devices that are not expected to produce significant vehicular velocity change, but may otherwise be hazardous. Examples of this class are barricades, portable sign supports and signs, intrusion alarms, and vertical panels. All Category 2 devices shall meet the requirements of the NCHRP Report 350. For the purpose of definition, a sign support and sign shall be considered a single unit.

c. Category 3 is for hardware expected to cause significant velocity changes or other potentially harmful reactions to impacting vehicles. Examples of this class are barriers, fixed sign supports, crash cushions, Truck-Mounted Impact Attenuators (**TMA**s), and other Work zone devices not meeting the definitions of Categories 1 or 2. Many Category 3 devices are defined in the design of the Project. Where this is the case, the NCHRP Report 350 requirements shall be incorporated into the design. Where the device is a product chosen by the Vendor, the device chosen must comply with the requirements of the NCHRP Report 350.

d. Category 4 includes portable or trailer-mounted devices such as arrow displays, temporary traffic signals, area lighting supports, and Portable Changeable Message Signs (**PCMS**). Presently, there is no implementation schedule for mandatory crashworthiness compliance of these devices.

The condition of signs and traffic control devices shall be new or "acceptable" as defined in the ATSSA *Quality Guidelines for Work Zone Traffic Control Devices*, and will be accepted based on a visual inspection by the Traffic Control Supervisor. WSDOT may also identify devices that are unacceptable. WSDOT's decision on the condition of a sign or traffic control device will be final. The Vendor shall remove a sign or traffic control device determined to be unacceptable, and replace it within twelve (12) hours of notification.

4.2.2. Traffic Management Plan (TMP)

The Vendor shall develop a TMP that includes the following items:

a. Procedures to identify and incorporate the needs of emergency service providers, law enforcement entities, and other related corridor users. The Vendor shall also include procedures to ensure all information required by these agencies to protect the public is made available.

b. Provisions for incident and emergency Key Project Staff.

c. Methods and frequency of inspection and maintenance of all traffic control throughout the Project limits, including Key Project Staff times to correct, modify, or implement changes to signing.

d. Descriptions of contact methods, personnel available, and Key Project Staff times for Key Project Staffs to any conditions requiring attention during off-hours. Include communications plan to WSDOT radio and field offices.

e. Identification of measurable limits for the repair and replacement of traffic control devices.

f. Procedures to modify the plans, as needed, to adapt to current Project circumstances.

g. Procedures to accommodate adjacent project's MOT Plans, if applicable (See Appendix 2, Section 5, Concurrent Projects).

h. Procedures to accommodate the MOT Plans when the staging schedule of the Project or any adjacent project changes.

4.2.3. Traffic Incident Management Plan (TIMP)

During installation, MOT will become increasingly sensitive to incidents such as equipment malfunctions, traffic crashes, inclement weather, and special events. The Vendor shall prepare and implement a formal TIMP to address how these incidents shall be managed.

The TIMP shall identify methods for incident detection and verification, Key Project Staff, site management, clearance, and motorist information. The TIMP shall include procedures for interaction with the TMC. In addition, if any local agencies along the Project corridor have adopted incident management guidelines, the Vendor shall be responsible for coordinating with local policies and procedures.

The TIMP shall reflect proposed construction phasing. The Vendor shall modify and implement the TIMP in conjunction with planned special events. The TIMP shall include specific time limits for the detection, verification, and classification of incidents, as well as for the dissemination of information about the incidents. The TIMP shall provide a mechanism to review and capture lessons learned from incidents.

The TIMP shall identify and provide for the incorporation of design elements to aid incident management, including turn-around for emergency vehicles, emergency access points, incident investigation sites, and signing to help motorists report the location of incidents in the Project.

The Vendor will not be required to provide Incident Response Team equipment or personnel; however, the Vendor shall make materials and equipment available that are on site as requested by WSDOT or the Washington State Patrol.

4.2.3.1. Emergency Vehicle Access

Emergency vehicle access shall be maintained through all nighttime, weekend, and evening closures, when feasible.

4.2.3.2. Highway Advisory Radio (HAR)

There are existing Highway Advisory Radio (**HAR**) transmitters located within the Project area. The existing HAR transmitters may be used by WSDOT to provide motorists with incident and construction-related information prior to entering the Work zone.

4.2.3.3. Vendor Response Time

The Vendor shall have a Traffic Control Supervisor on call or on site equipped with a mobile phone that can respond to and take appropriate action to manage an emergency situation. The Traffic Control Supervisor shall be at the Work site within forty-five (45) minutes of notification of an emergency situation. Upon arrival, the Traffic Control Supervisor shall have the experience, resources, and equipment required to set up temporary traffic control, as necessary.

4.2.4. MOT Plans

The Vendor shall use the procedures in the TMP to develop detailed MOT Plans that provide for all installation stages and phasing, and identify opportunities to expedite installation throughout the course of the Project.

The MOT Plans shall show the necessary installation signs, flaggers, spotters, and other traffic control devices required to support the Work. The Vendor shall be solely responsible for submitting proposed MOT Plans to WSDOT and obtaining WSDOT's comments.

At a minimum, the MOT Plans shall include the following items:

a. Complete plan sheets and details for all stages of installation.

b. The spacing, size, color (legend and background, if applicable), and quantity of all traffic control devices.

c. Work areas, including ingress and egress for construction vehicles.

d. Roadway plan sheets with the location of each sign so it can be easily read in relation to the roadway and other traffic control devices. A small-scale layout of each sign shall be shown on the corresponding roadway plan sheet where the sign is to be placed.

e. Drawings on how to fabricate any sign not detailed in the then current WSDOT Sign Fabrication Manual showing dimensions, background color, and legend.

f. Methods for covering, partially covering, or modifying signs when not applicable to the current phase of installation.

The MOT Plans shall be complete, including all necessary details. Typical traffic control configurations, such as those found in the FHWA MUTCD and the then current WSDOT *Work Zone Traffic Control Guidelines*, may be used to assist in developing the MOT Plans. Only site-specific MOT Plans shall be used by the Vendor, typical plans are not acceptable unless incorporated as details into the MOT Plans.

4.2.5. Allowable Closures

This section lists the allowable lane, ramp, and shoulder closure hours on SR 520 during the Project. Any restrictions for roadway segments not listed in this section require WSDOT approval. No lane, ramp, or shoulder closures shall occur outside of the hours specified within this section, unless approved in advance and in writing by WSDOT.

No temporary lane, ramp, or shoulder closures or restrictions, including set-up of traffic control devices, will be allowed, except during the hours where permitted lane, ramp and shoulder closures are allowed. In addition, no Work that restricts or interferes with traffic will be allowed from 12:00 p.m. on the day preceding, through 12:00 p.m. on the day following, a holiday or holiday weekend. Holidays that occur on Friday, Saturday, Sunday, or Monday are considered a holiday weekend. January 1, the third Monday of January, the third Monday of February, Memorial Day, July 4, Labor Day, November 11, Thanksgiving Day, the day after Thanksgiving, and Christmas Day shall be considered holidays. When any of these holidays fall on a Sunday, the following Monday shall be considered a holiday. When any of these holidays fall on a Saturday, the preceding Friday shall be considered a holiday.

In addition, closures will not be allowed on any roadways in the Project area during the following time periods:

a. Vancouver Winter Olympics - February 12 to February 28, 2010.

b. Annual Seafair Hydroplane Race Weekend from 12 p.m. Friday to 8:00 p.m. Sunday.

c. Scheduled closures of the I-90 floating bridge.

d. Two (2) scheduled closures of the SR 520 floating bridge.

e. Four (4) scheduled closures of the Alaskan Way Viaduct.

Exceptions to the allowable lane closures may be necessary to accommodate wide loads or other permit loads through the temporary traffic control area. In addition, the Vendor shall coordinate with adjacent concurrent projects to provide continuity in the lane configurations.

The Vendor shall coordinate their Work activities with other local events in the area, so that the events will not be impacted. In addition, closures will not be allowed during the

following Annual Special Events, including the two-hour period prior to and the two-hour period after the Event.

a. Seattle Center Events (single event or combination of events) with projected combined attendance over 8,000
b. All Seattle Seahawk and University of Washington home football games
c. Major Safeco Field and QWEST Field events with projected attendance over 25,000
d. M. L. King Jr. March
e. Northwest Flower and Garden Show
f. Northwest Women's Show
g. Opening Day of Boating Season
h. University Street Fair
i. Beat the Bridge
j. Pike Place Market Festival
k. Graduation Ceremonies at QWEST Field and Hec Edmundson Pavilion
l. Seafair Rock n Roll Marathon
m. Pride Parade and Festival
n. Lake Union Wooden Boat Festival
o. July 4th Fireworks in all of the following cities: of Seattle, Bellevue, Kirkland, Redmond and Mercer Island
p. Bite of Seattle
q. Capitol Hill Block Party
r. Seafair Triathlon
s. Seafair Torchlight Run & Parade
t. Blue Angels
u. Hempfest
v. Danskin Women's Triathlon
w. Pacific Northwest Arts & Crafts Fair
x. Bumbershoot
y. Seattle Marathon
z. LiveStrong

WSDOT reserves the right to not approve traffic restrictions and freeway closures. The Vendor shall coordinate with WSDOT for details regarding lane closure restrictions.

4.2.5.1. Eastbound SR 520 Allowable Lane Closures

The Vendor shall, at a minimum, maintain the existing configuration at all times outside of the allowable closures described in this section, unless otherwise permitted in this section.

Eastbound SR 520 Mainline (3 lane section)				
Existing Configuration	2 GP + 1 HOV			
Allowable Closure Times	Sun Night to Mon Morning Mon Night to Tue Morning Tue Night to Wed Morning Wed Night to Thur Morning Thur Night to Fri Morning		Sat Night to Sun Morning	
	From	**To**	**From**	**To**
HOV lane closed	9:00 p.m.	5:00 a.m.	-	-
HOV and 1 adjacent lane closed	10:00 p.m.	5:00 a.m.	-	-
1 GP lane closed	9:00 p.m.	5:00 a.m.	-	-
2 GP lanes closed	11:00 p.m.	5:00 a.m.	-	-

Eastbound SR 520 Mainline (2 lane section)				
Existing Configuration	2 GP			
Allowable Closure Times	Sun Night to Mon Morning Mon Night to Tue Morning Tue Night to Wed Morning Wed Night to Thur Morning Thur Night to Fri Morning		Sat Night to Sun Morning	
	From	**To**	**From**	**To**
1 GP lane closed	11:00 p.m.	5:00 a.m.	-	-

4.2.5.2. Westbound SR 520 Allowable Lane Closures

The Vendor shall, at a minimum, maintain the existing configuration at all times outside of the allowable closures described in this section, unless otherwise permitted in this section.

Westbound SR 520 Mainline (3 or more lane section)		
Existing Configuration	2 or more GP + 1 HOV	
Allowable Closure Times	Sun Night to Mon Morning	Sat Night to Sun

	Mon Night to Tue Morning Tue Night to Wed Morning Wed Night to Thur Morning Thur Night to Fri Morning		Morning	
	From	**To**	**From**	**To**
HOV lane closed	7:00 p.m.	5:00 a.m.	-	-
HOV and 1 adjacent lane closed	11:00 p.m.	5:00 a.m.	-	-
1 GP lane closed (HOV opened to all traffic)	8:00 p.m.	5:00 a.m.	-	-
2 GP lanes closed (HOV opened to all traffic)	11:00 p.m.	5:00 a.m.	-	-
3 GP lanes closed (HOV opened to all traffic)	11:00 p.m.	5:00 a.m.	-	-

Westbound SR 520 Mainline (2 lane section)				
Existing Configuration	2 GP			
Allowable Closure Times	Sun Night to Mon Morning Mon Night to Tue Morning Tue Night to Wed Morning Wed Night to Thur Morning Thur Night to Fri Morning		Sat Night to Sun Morning	
	From	**To**	**From**	**To**
1 GP lane closed	11:00 p.m.	5:00 a.m.	-	-

4.2.5.3. Allowable Ramp Closures

The Vendor shall maintain the existing ramp configurations at all times outside of the allowable closures described in this section, unless otherwise permitted.

Consecutive off-ramps or on-ramps shall not be closed concurrently. No ramp shall be closed if it is being used as a detour for another ramp closure. No more than one ramp in the same freeway-to-freeway interchange shall be closed at the same time. The following allowable ramp closure limitations shall apply:

SR 520 Ramps Within the Project Limits

	From	**To**
Mon, Tue, Wed, and Thur Nights	10:00 p.m.	5:00 a.m.
Saturday Night	-	-
Sunday Night	-	-

4.2.5.4. Full SR 520 Freeway Closure

Full freeway closures of either eastbound or westbound SR 520 shall be permitted as follows:

SR 520 Freeway Closures

	From	To
Mon, Tue, Wed, and Thur Nights	12:00 a.m.	4:00 a.m.
Saturday Night	-	-
Sunday Night	-	-

A maximum of eight (8) full freeway night closures shall be permitted per direction. Simultaneous total closure of both eastbound and westbound SR 520 shall not be permitted.

4.2.5.5. Signs and Traffic Control Devices

All signs and traffic control devices for lane, ramp, and roadway closures shall be installed only during the hours specified in this section. If placed earlier than the specified hours of closure, the installation signs shall be turned or covered so as not to be visible to motorists.

4.2.5.6. Hour Adjustment

If WSDOT determines that the permitted closure hours adversely affect traffic, causing queues that extend beyond one and one half (1 ½) miles for any lane, ramp, or total roadway closure, WSDOT may adjust the closure hours accordingly. WSDOT will notify the Vendor in writing of any change in the closure hours.

4.2.5.7. Public Notification

The Vendor shall furnish and install information signs that provide advance notification of ramp and road closures a minimum of seven (7) Calendar Days prior to the scheduled closure. The signs shall have a black legend on a white reflective background. Sign locations, messages, letter sizes, and sign sizes shall be shown in the MOT Plans. For ramp closures, PCMS shall be used to supplement the required signs. The Vendor shall notify the Washington State Patrol, local fire departments, police departments, city engineering departments, public transit agencies, and the affected school districts in writing a minimum of seven (7) Calendar Days prior to scheduled closures. The Vendor shall provide written copies of these notifications to WSDOT.

4.2.6. Maintenance of Traffic Requirements

The Vendor shall plan, manage, supervise, and perform all temporary traffic control activities required to support the Work using labor, equipment, and materials provided by

the Vendor (except when such labor, equipment, or materials are to be provided by WSDOT as specifically identified herein).

The traffic control devices must be continually and adequately monitored and maintained to ensure proper placement and working order, and to ensure the safe and efficient flow of all traffic through and adjacent to the Project.

All materials shall meet the requirements of Section 9-35 of the **Standard Specifications**.

4.2.6.1. Traffic Control Personnel

The Vendor shall designate one or more people to perform the duties of the primary Traffic Control Supervisor, and identify an alternate Traffic Control Supervisor who can assume the duties of the primary Traffic Control Supervisor in the event of that person's inability to perform. The Traffic Control Supervisor shall be responsible for safe implementation of the approved MOT Plans.

The Traffic Control Supervisor shall be certified as a Work site traffic control supervisor by one of the following agencies:

The Northwest Laborers-Employers Training Trust
27055 Ohio Avenue
Kingston, WA 98346
(360) 297-3035

Evergreen Safety Council
401 Pontius Avenue North
Seattle, WA 98109
1-800-521-0778 or
(206) 382-4090

Possession of a current flagging card by the Traffic Control Supervisor is mandatory.

The Vendor shall provide all personnel for execution of all procedures related to temporary traffic control, and setup, maintenance, and removal of all temporary traffic control devices and construction signs necessary to control traffic during installation operations.

All personnel engaged in execution of all procedures related to temporary traffic control shall wear reflective vests and hard hats. During hours of darkness, white coveralls or white or yellow rain gear shall be worn. The vests and other apparel shall be in accordance with Section 1-07 of the Standard Specifications.

4.2.6.1.1. Traffic Control Supervisor

A Traffic Control Supervisor shall be present on the Project whenever flagging, spotting, or other traffic control is occurring; or less frequently, as authorized by WSDOT.

The Traffic Control Supervisor shall personally perform all of the duties of the Traffic Control Supervisor. During non-working hours, the Traffic Control Supervisor shall be available at the Project within forty-five (45) minutes after notification by WSDOT.

The Traffic Control Supervisor's duties shall include the following:

a. Possessing a current set of approved MOT Plans; applicable Contract provisions as provided by the Vendor; the latest adopted edition of the Washington State and FHWA MUTCDs, including the Washington State Modifications to the MUTCD; the publication Quality Standards for Work Zone Traffic Control Devices; and applicable standards and specifications.

b. Inspecting traffic control devices and nighttime lighting for proper location, installation, message, cleanliness, and effect on the traveling public. Traffic control devices shall be inspected at least once per hour during working hours, except that Class A signs and nighttime lighting may be inspected only twice a week. Traffic control devices left in place for 24 hours or more shall also be inspected once during non-working hours when they are initially set up (during daylight or darkness, whichever is opposite of the working hours). The Traffic Control Supervisor shall correct, or arrange to have corrected, any deficiencies noted during these inspections.

c. Preparing a daily traffic control diary on each day that traffic control is performed using DOT Forms 421-040A and 421-040B and submitting them to WSDOT no later than the end of the next Business Day. The daily traffic control diaries shall be maintained at the Project office and made available to WSDOT at any time upon request. The Vendor may use alternate forms if approved by WSDOT. Diary entries shall include, but are not limited to, the following:

    i. Time of day when signs and traffic control devices are installed and removed.

    ii. Location and condition of signs and traffic control devices.

    iii. Revisions to the MOT Plans.

    iv. Lighting used at night.

    v. Observations of traffic conditions.

d. Making minor revisions to the MOT Plans to accommodate site conditions, provided that the original intent of the MOT Plans is

maintained. The revisions shall be documented in the daily traffic control diary.

e. Attending traffic control coordination meetings or coordination activities, including meetings and activities for adjacent projects, as necessary, for a complete understanding of the Project and effective performance.

f. Ensuring that all required traffic control devices and equipment are available and in good working condition prior to the need to install or use them.

Provided that the duties of the Traffic Control Supervisor are accomplished, the Traffic Control Supervisor may perform other duties described in this section.

The Traffic Control Supervisor shall be considered a critical component of the Vendor's management team, and shall have prior experience managing MOT operations on similarly complex projects. Registration as a licensed Professional Engineer is not required.

The Traffic Control Supervisor or a designee shall be available on a 24-hour basis with a single contact phone number throughout the duration of the Project; supervise and verify all changes in the MOT setup; and perform daily Project reviews to verify that MOT devices are correctly placed and traffic is safely and efficiently moving through the Project. The Traffic Control Supervisor or a designee shall be available on the Project within forty-five (45) minutes of notification of an emergency situation, and shall be prepared to positively respond to the need to repair the traffic control system or to provide alternate traffic arrangements. The Traffic Control Supervisor shall have the resources, ability, and authority to expeditiously correct any deficiencies in the traffic control system, or to demobilize any construction operation that is resulting in excessive delays to traffic or creating an unsafe condition.

The Traffic Control Supervisor shall maintain a thirty (30) Calendar Day advance schedule of all traffic control activities and a long-range schedule for all planned ramp and roadway closures.

When temporary traffic control measures are in place, the Traffic Control Supervisor shall perform drive-through inspections each Calendar Day and immediately after any shift in MOT setup, while crews are still on-site to make modifications. The results of the inspections shall be documented in a daily report that, at a minimum, lists the time frame of the drive-through inspection and the defects noted. The report shall also document any maintenance or corrective action ordered as a result of the inspection, and the name and position of the Vendor's personnel who have been directed to provide the maintenance or corrective action. The daily report shall state that the MOT setup and all traffic control devices substantially conform to the Contract requirements, except as noted, and shall be signed by the Traffic Control Supervisor.

4.2.6.2. Traffic Control Procedures

4.2.6.2.1. Rolling Slowdown

Rolling slowdown traffic control operations shall not be used for routine Work that can be addressed by standard lane or shoulder closure traffic control. When a short-term roadway closure of fifteen (15) minutes or less is needed for an infrequent, non-repetitive Work operation the Vendor may implement a rolling slowdown on a multilane roadway, as part of an approved traffic control plan. Rolling slowdowns on SR 520 will only be permitted between 12:01 a.m. and 4:00 a.m., Sunday through Friday.

Where included in the approved MOT Plans, a rolling slowdown shall be accomplished using one (1) traffic control vehicle with flashing amber lights for each lane to be slowed down, plus one (1) control vehicle to serve as a chase vehicle for traffic ahead of the blockade. The Vendor shall provide and pay for a minimum of two (2) Washington State Patrol officers per direction, for mainline rolling slowdowns. The traffic control vehicles shall enter the roadway and form a moving blockade to reduce traffic speeds and create a clear area in front of the moving blockade to accomplish the Work without a complete stoppage of traffic.

A Portable Changeable Message Sign (PCMS) shall be placed ahead of the starting point of the traffic control to warn traffic of the slowdown. The sign shall be placed far enough ahead of the Work to avoid any expected backup of vehicles.

The location where the traffic control vehicles shall begin the slowdown and the speed at which the moving blockade shall be allowed to travel shall be calculated to accommodate the estimated time needed for closure. The chase control vehicle shall follow the slowest vehicle ahead of the blockade. When the chase vehicle passes, the Vendor may begin the Work operation. In the event that the Work operation is not completed when the moving blockade reaches the site, all Work, except the Work necessary to clear the roadway, shall cease immediately, and the roadway shall be cleared and reopened as soon as possible.

All ramps and entrances to the roadway between the moving blockade and the Work operation shall be temporarily closed using construction vehicles. Radio communications between the Work operation and the moving blockade shall be established and utilized to adjust the speed of the blockade to accommodate the closure time needed.

If more than one rolling slowdown occurs during the same period, the Vendor shall ensure that any queues originating from previous rolling slowdowns have fully dissipated.

4.2.6.2.2. Lane Closure Setup/Takedown

Where allowed by the Contract and where shown on the approved MOT Plans or as directed by WSDOT, the Vendor shall establish traffic control measures to close one or

more lanes of a multilane facility. When this is scheduled to occur, the Vendor shall adhere to the following sequence:

a. Set up advance warning signs on the shoulder of the roadway opposite the lane to be closed.

b. Set up advance warning signs on the same shoulder as the lane to be closed.

c. Move a Truck Mounted Attenuator (TMA) with arrow board into place at the beginning of the closure taper.

d. Place channelization devices to mark the taper and the length of the closure as shown on the MOT plans.

e. Once the lane is closed, the TMA/arrow board combination may be replaced with an arrow board without attenuator.

If additional lanes are to be closed, this shall be done in sequence with previous lane closures, using the same sequence of activities. A TMA with arrow board is required during the process of closing each additional lane, and may be replaced with an arrow board without attenuator after the lane is closed. Each closed lane shall be marked with a separate arrow board at all times.

Traffic control for lane closures shall be removed in the reverse order of its installation.

4.2.6.2.3. Patrol and Maintain Traffic Control Measures

When temporary traffic control measures are in place, the Vendor shall patrol and maintain these measures at all times. The Work shall consist of resetting mislocated devices; assuring visibility of all devices; cleaning and repairing where necessary; providing maintenance for all equipment, including replacing batteries and light bulbs, as well as keeping motorized and electronic items functioning; and adjusting the location of devices to respond to actual conditions, such as queue length, unanticipated traffic conflicts, and other areas where planned traffic control has proven ineffective.

This Work shall be performed by the Vendor, either by or under the direction of the Traffic Control Supervisor. Personnel, with vehicles if necessary, shall be dispatched so that all traffic control can be reviewed at least once per hour during working hours, and at least once during each Calendar Day.

4.2.6.3. Traffic Control Devices

Traffic control devices are used to visually guide drivers through Work zones. Signing, channelizing devices, arrow boards, and warning beacons all display a message to the driver. Work zone credibility is established through the proper use of these devices to send correct messages to drivers. Poor Work zone credibility has a direct, negative impact on Work zone safety by causing driver confusion, frustration, and disrespect, which results in a high potential for accidents.

4.2.6.3.1. Construction Signs

All construction signs required by the approved MOT Plans, as well as any other appropriate signs directed by WSDOT, shall be provided by the Vendor. The Vendor shall provide the posts or supports, and erect and maintain the signs in a clean, neat, and presentable condition until they are no longer required. Post-mounted signs shall be installed as shown in the applicable WSDOT *Standard Plan(s)*. Sign attachment to posts shall conform to the applicable detail shown in the Standard Plans. When the construction signs are no longer required, the Vendor shall remove all signs, posts, and supports from the Project and they shall remain the property of the Vendor.

Construction signs are divided into two classes. Class A construction signs are those signs that remain in service throughout the construction or during a major phase of the Work. They are mounted on posts, existing fixed structures, or substantial supports of a semi-permanent nature. Class A signs shall be designated as such on the approved MOT Plans. "Do Not Pass" and "Pass With Care" signs are Class A construction signs. Sign and support installation for Class A signs shall be in accordance with the applicable WSDOT *Standard Plan(s)*. Class B construction signs are those signs that are placed and removed daily, or are used for short durations which may extend for one (1) or more days. They are mounted on portable or temporary mountings.

Where it is necessary to add weight to signs for stability, the Vendor shall follow the manufacturer's recommendations for sign ballasting.

Signs, posts, or supports that are lost, stolen, damaged, destroyed, or which WSDOT deems to be unacceptable while used on the Project, shall be replaced by the Vendor.

4.2.6.3.2. Sequential Arrow Signs

Where shown on the approved MOT Plans or when requested by WSDOT, the Vendor shall provide, operate, and maintain sequential arrow signs. In some locations, the signs shall be shown on the MOT Plans as a unit with a TMA. In other locations, the MOT Plans shall indicate a stand-alone unit.

4.2.6.3.3. Portable Changeable Message Signs (PCMS)

Where shown on the approved MOT Plans or when requested by WSDOT, the Vendor shall provide, operate, and maintain PCMS. The Vendor shall provide a minimum of 4 PCMS available for use throughout the duration of the Project, and shall provide additional PCMS as required. These signs shall be available on site for the entire duration of their anticipated use.

4.2.6.3.4. Barricades

Where shown on the approved MOT Plans or when requested by WSDOT, the Vendor shall furnish, install, and maintain barricades. Barricades shall be kept in good repair,

and shall be removed and/or replaced immediately when, in the opinion of WSDOT, they are no longer functioning as designed.

Where it is necessary to add weight to barricades for stability, the Vendor shall follow the manufacturer's recommendations for sign ballasting.

4.2.6.3.5. Traffic Safety Drums

Where shown on the approved MOT Plans, or when requested by WSDOT, the Vendor shall furnish, install, and maintain traffic safety drums.

Used traffic safety drums may be utilized, provided all drums used on the Project are of essentially the same configuration and in acceptable condition.

Traffic safety drums shall be designed to resist overturning by means of a weighted lower unit that will separate from the drum when impacted by a vehicle.

Traffic safety drums shall be regularly maintained to ensure that they are clean and that the drum and reflective material are in good condition. If WSDOT determines that a drum has been damaged beyond usefulness, or provides inadequate reflectivity, a replacement drum shall be provided by the Vendor at no cost to WSDOT.

When WSDOT determines that the traffic safety drums are no longer required, they shall be removed from the Project and shall remain the property of the Vendor.

4.2.6.3.6. Traffic Cones

Where shown on the approved MOT Plan, or when requested by WSDOT, the Vendor shall furnish, install, and maintain traffic cones. The Vendor shall not use traffic cones on ramps or on the interstate. Traffic cones shall be kept in good repair, and shall be removed immediately when directed by WSDOT. Where wind or moving traffic frequently displaces cones, an effective method of stabilizing cones, such as stacking two together at each location, shall be employed.

4.2.6.3.7. Tubular Markers and Tall Channelizing Devices

The Vendor shall not use tubular markers or tall channelizing devices on ramps or state highways.

4.2.6.3.8. Warning Lights and Flashers

The Vendor shall provide and maintain Type C, steady-burning lights attached to traffic safety drums, barricades, or other traffic control devices used for lane closures or shifting tapers during hours of darkness.

4.2.6.3.9. Truck-Mounted Attenuator (TMA)

Where shown on the approved MOT Plans, or when requested by WSDOT, the Vendor shall provide, operate, and maintain TMA. These attenuators shall be available, on site, for the entire duration of their anticipated use.

The TMA shall be positioned to separate and protect construction Work zone activities from normal traffic flow. During use, the attenuator shall be in the full down-and-locked position. For stationary operations, the truck's parking brake shall be set.

4.3. Installation Work

The Vendor shall conduct all Work necessary to mount items to the SR 520 Bridge and structures for the Project. Elements of such installation Work shall include, but are not limited to, the following:

a. Mount toll equipment and associated appurtenances to the existing SR 520 East High Rise structure.

b. Affix conduit to the outside of existing structures up to the provided junction box to accommodate power and communications conductors to toll equipment.

4.3.1. Cooperation with Other Contractors

The Vendor shall be aware that other contractors may be performing work in the vicinity of the SR 520 **Toll Zone** at any time for the duration of the Contract. The Vendor shall cooperate with WSDOT and other contractors in the performance of any concurrent activities occurring at or near the SR 520 Toll Zone. The Vendor shall coordinate Work schedules with WSDOT and other contractors to ensure the smooth implementation of all SR 520 tolling installation and construction activities

4.3.2. Mounting to the Existing Structure

Equipment mounted to existing structures, including tolling equipment and conduit, shall be mounted as required in the Standard Specifications and this section. Mechanical clamping or banding is the preferred method of mounting to the east high rise truss structure due to the lead based coating. If the Vendor elects to weld, drill, cut into, or disturb any part of the truss structure or to remove any of the paint for any reason, all appropriate environmental procedures shall be followed. All mounting methods shall comply with the Environmental Compliance Plan as defined in Section 4.6.1.

Cranes, drill rigs, and other construction equipment exceeding the legal load shall not be operated on structures without WSDOT's written approval.

4.3.2.1. Drilling

Percussion drilling of existing structures shall be the only approved method of drilling.

The following types of drilling shall not be allowed:

a. Core-drilling into concrete structures.

b. Drilling into prestressed concrete girders.

c. Drilling into reinforced concrete box girder bottom slabs, or into the bottom 7 inches of the webs.

d. Drilling into round concrete columns for conduit placement.

Any holes drilled but not utilized shall be completely filled and patched to match the surface quality and appearance of the surrounding material.

The Vendor shall positively locate any embedded conduit in structures prior to drilling. The Vendor shall avoid embedded conduit during drilling operations. Damage to embedded conduit and/or conduit contents due to drilling operations shall be repaired or replaced to the Engineer's satisfaction at no cost to WSDOT.

4.3.2.2. Welding

Conduits shall be connected to structural steel elements using positive methods. Conduit clamps that rely on friction or staking mechanisms shall not be permitted.

Welding or flame cutting of any structural steel for the purpose of conduit mounting shall not be allowed.

Any holes drilled into structural steel elements that are not utilized shall be plugged by a structural steel bolt in accordance with the Standard Specifications.

4.4. Electrical and Intelligent Transportation Systems (ITS)

The Vendor shall keep the existing Intelligent Transportation Systems (**ITS**) functioning throughout installation of the Project. This section discusses Electrical and ITS standards and installation criteria.

The Vendor shall maintain electrical power to all ITS devices during installation. The Vendor shall maintain communications between all ITS devices and the Traffic Management Center (TMC) during installation.

4.4.1. Testing of WSDOT-Provided Infrastructure

Prior to the performance of any Work the Vendor may request a meeting where the Vendor will perform Work with WSDOT, in order to determine that all WSDOT-Provided Infrastructure is in proper working order. At the time of this meeting all loops, cabling, connectors, and cabinet operations may be tested by the Vendor. The Vendor shall be responsible for requesting, coordinating, and conducting the on-site meeting, and for providing all labor, materials, test equipment, and test documentation. All testing shall be non-destructive. If the Vendor begins Work at the Project site without arranging this pre-testing, WSDOT will assume that all cabinet components and operations were in proper working order prior to the performance of any Work, and the Vendor shall be responsible for ensuring that all cabinet components and operations are in proper working order during and upon the completion of the Work. If no pre-testing is completed, any equipment that is not functioning upon the completion of the Work will be assumed to

have been in proper working order as of the date of Notice to Proceed, and shall be replaced at the Vendor's expense.

4.4.1.1. Twisted Pair (TWP) Cable Testing

The Vendor shall perform a test on the installed cable. Each pair shall be tested for frequency attenuation between the communication hub and each ITS device. WSDOT will provide a witness during the tests and the test results shall be documented.

Any pairs showing attenuation greater than two (2) dB per mile at one (1) kHz shall be cause for rejection of the cable. WSDOT shall replace any cable failing this test. The Vendor shall provide all test equipment necessary to perform the tests.

All pairs of each underground cable shall be tested for continuity, polarity, shorts, grounds, longitudinal balance, and both resistive and impedance losses consistent with the manufacturer's specifications and standard telecommunication industry requirements

Each **TWP** copper cable intended primarily for data communication applications shall be tested end-to-end from the controlled environment vault cable termination point to the interface at the traffic control device. The transmission test procedure shall include the continuity testing of each pair within each TWP cable from the outlet in the termination panel in the vault to the termination outlet at each device location.

The Vendor shall ensure that all individual wires in all TWP cables have been terminated consistent with the wire insulation color to termination pin requirements set forth in this section.

The Vendor shall provide WSDOT with the manufacturer and model number of the test equipment and the equipment calibration procedures to be used prior to conducting all tests.

The Vendor shall test each underground cable end-to-end from the controlled-environment vault-termination block to the terminal block at each cable pedestal or other outside plant terminal equipment. The Vendor shall provide actual test readings for each of the following items to verify the required transmission criteria:

a. DC Resistance - The resistance of any conductor in any cable shall not exceed 20 ohms per 1000 feet.

b. DC Resistance Unbalance - The resistance unbalance between the two conductors of any pair shall not exceed 5%.

c. Ambient Noise Measurements - The Vendor shall measure the ambient noise level in dBm0 to determine the level of noise on each cable being tested. The distant end of the pair being tested should be terminated with a 600-ohm resistor. At the near end, an HP-3551 or equivalent transmission measuring set should be configured for conducting a noise reading test. Cable pairs being sampled shall provide an ambient noise figure of 30 Dbm0 (-60 dBm) or better. The Vendor shall record all readings.

d. Shield Continuity -Test and measurements shall be made to assure that all underground cable shields are continuous from end-to-end. Each shield shall show a resistance of not more than .75 ohms per 1000 feet.

4.4.1.2. Fiber-Optic Cable Testing

The Vendor shall perform fiber-optic cable testing according to the Standard Specifications. Section 8-20.3 of the Standard Specifications is supplemented with the following:

The installed optical fiber cable shall be tested for compliance with the transmission requirements of this specification, the cable and hardware manufacturer's specifications, and prescribed industry standards and practices.

WSDOT shall take corrective actions on portions of the fiber installation determined to be out of compliance.

4.4.2. Maintenance and Operation of ITS Components

The Vendor shall use every precaution to ensure that no Work causes disruptions to the existing systems, except those disruptions that are planned and approved in advance, as defined herein.

Existing systems include, but are not limited to, the following:

a. All ITS field devices, such as ramp meter, data collection, and **CCTV** systems, within the Project limits.

b. Fiber-optic and TWP data and video communication systems on SR 520.

4.4.2.1. Continuous Function of Existing ITS

The Vendor shall ensure continuous functionality of the existing ITS system during installation.

Existing ITS elements, including, but not limited to, CCTV cameras, ramp meters, **DMS**, HAR, and data stations, shall remain operational during installation of the Project, except during the allowable working hours.

4.4.2.2. Planned Disruptions

Work required by this RFP may require disruptions to existing systems, circuits, and equipment. The Vendor shall schedule the work and predetermine the affected system(s), extent, start time, and duration of planned disruptions. Planned disruptions will only be allowed when a cutover from an existing system occurs, and shall be scheduled between the hours of 8:00 p.m. and 4:00 a.m. Failure of the Vendor to restore disrupted systems and equipment prior to 4:00 a.m. will constitute an unplanned disruption, and the "Restoration Procedure" below will apply.

4.4.2.3. Disruption Request

Twenty-one (21) Calendar Days prior to planned disruptions of any existing system, circuit, or equipment, the Vendor shall submit to WSDOT for approval a written Disruption Request. Each Disruption Request shall include the system(s) to be affected, the disruption start date and time, and the estimated duration required. The Vendor shall submit a separate, numbered Disruption Request for each planned disruption. Disruption Request approval or rejection will be returned to the Vendor in writing by WSDOT at least seven (7) Calendar Days prior to the proposed start of the disruption. WSDOT may reject a requested time or duration and verbally recommend an alternate time or duration agreeable to both the Vendor and WSDOT.

4.4.2.4. Restoration Procedure

Any unplanned disruptions determined by WSDOT to be caused by the actions of the Vendor or the Vendor's representative(s) shall be corrected by the Vendor at no additional cost to WSDOT.

Upon the occurrence of an unplanned disruption and subsequent notification by WSDOT, the Vendor shall immediately stop all other ITS work in progress and shall expend all efforts to restore the disrupted system(s) or correct the problem causing the disruption. The Vendor will not be granted an extension of time for delays caused by the repair of disrupted systems.

4.4.2.5. Allowable Working Hours on the ITS

All ITS devices, whether inside or outside of the Project limits, shall not be taken out of operation by the Vendor, and shall remain operational during all phases of installation.

Normal hours of operation of active ITS elements not in continuous operations, such as ramp meters, shall be defined by WSDOT.

The Vendor shall not work on active ITS elements within the Project limits from 4:00 a.m. to 8:00 p.m.

Unless otherwise specified in this RFP, the Vendor shall contact WSDOT a minimum of seven (7) Calendar Days prior to performing any Work on existing and active ITS devices and thirty (30) Calendar Days in advance of performing any Work on any hub. The Vendor shall perform all Work in a manner ensuring the integrity and proper performance of all ITS components.

4.4.3. WSDOT Personnel

The Vendor shall coordinate the Work with WSDOT personnel as required. The Vendor shall coordinate ITS Work with the following WSDOT staff:

4.4.3.1. WSDOT ITS Implementation Engineer

The WSDOT ITS Implementation Engineer will perform the following:

a. Review the certification of test device calibration (to **ANSI** specified guidelines).

b. Review and make recommendations for acceptance to WSDOT of the required documentation including specifications, shop drawings, and all measured and recorded values for the system and for each cabinet.

c. Oversee connections to the existing ITS communication network.

4.4.3.2. WSDOT Electrical Inspector

The Washington State Department of Labor and Industries has authority over all electrical installations within the State of Washington. WSDOT has been granted authority over all electrical installations within the rights-of-way of State highways, provided WSDOT maintains and enforces an equal, higher, or better standard of construction, materials, devices, appliances, and equipment than is required by State law. It is the role of the WSDOT Electrical Inspector to assure that all electrical installations meet the requirements of the National Electric Code, and all applicable State laws and provisions.

The WSDOT Electrical Inspector will perform the following:

a. Perform periodic inspections during installation.

b. Witness required ITS field tests (as desired).

c. Inspect and approve all electrical and ITS installations in accordance with this RFP.

WSDOT will designate a WSDOT Electrical Inspector. The Vendor shall contact WSDOT to arrange for electrical inspection.

4.4.4. Installation Requirements

The Vendor shall not make final connections of the newly installed components to the existing system until receiving approval from WSDOT.

The Vendor shall use stainless steel mounting hardware such as bolts, nuts, washers, and external hinges on vaults, cabinets, shelters, junction boxes, and other devices. The Vendor shall use only components designed for ten (10) or more years of industrial use.

All material, equipment, and components furnished by the Vendor shall be new (within twelve (12) months from the date of manufacture), of the latest design and manufacture, in an operable condition at the time of delivery and installation, and compatible with the existing system.

The Vendor shall round and smooth sharp corners and edges on all components that the Vendor furnishes and installs.

4.4.4.1. Conduit

The Vendor shall provide conduit according to the Standard Specifications. Section 8-20.3(5) of the Standard Specifications is replaced with the following:

Installation of conduit shall conform to appropriate articles of the National Electric Code and this section.

In new conduits, conductors shall occupy a maximum of twenty-six (26) percent of the cross-section of the conduit. In existing conduits, conductor fill shall meet **NEC** requirements for conduit with three or more conductors, and shall occupy a maximum of forty (40) percent of the conduit's cross-sectional area.

Conduit shall be supplied as a system from a single manufacturer providing all of the steel and **PVC** conduit; all required fittings, terminations, and other installation accessories; all in accordance with the Standard Specifications and this section.

It shall be the option of the Vendor, at no expense to the WSDOT, to use larger size conduit if desired, and where larger size conduit is used, it shall be for the entire length of the run from outlet to outlet. Reducing couplings will not be permitted.

The ends of all conduits, metallic and non-metallic shall be reamed to remove burrs and rough edges. Field cuts shall be made square and true. Slip joints or running threads will not be permitted for coupling metallic conduit; however, running threads will be permitted in traffic signal head spiders and RGS outerduct. When installing rigid galvanized steel conduit and standard coupling cannot be used, an approved 3-piece coupling shall be used. The threads on all conduit shall be rust-free, clean. All couplings shall be tightened so that a good electrical connection will be made throughout the entire length of the conduit run. Non-metallic conduit shall be assembled using the solvent cement specified in Section 9-29.1 of the Standard Specifications. With the exception of connections to **HDPE** conduit, PVC conduit shall be connected with medium grade gray cement solvent applied per the manufacturer's recommendations. Where the coating on galvanized conduit has been damaged in handling or installing, such damaged areas shall be thoroughly painted with galvanizing repair paint, Formula A-9-73. All conduit including spare conduits shall be installed with bushings. Rigid galvanized steel conduit shall be installed with insulated grounding bushings which have standard threading that extends around the entire circumference of the bushing. PVC conduit shall be installed with molded one-piece end bell bushings. All conduit including spare conduits shall be installed with plugs, which shall not be removed until installation of conductors or pull string. Upon installation of wiring, all ITS conduit 2 inches in diameter or larger shall be sealed with an approved mechanical plug at both ends of the conduit run. Upon installation of wiring at other locations, conduit shall be sealed with duct seal. Upon installation of the pull string, spare conduit shall be plugged.

Metallic conduit bends shall have a radius consistent with the requirements of Article 344.24 and other articles of the National Electric Code. Where factory bends are not used, conduit shall be bent, using an approved conduit bending tool employing correctly sized dies, without crimping or flattening, using the longest radius practicable.

Nonmetallic conduit bends, where allowed, shall conform to Article 352.24 of the National Electric Code. 18-inch radius elbows shall be used for PVC conduit of 2-inch nominal diameter or less. Standard sweep elbows shall be used for PVC conduit with greater than 2-inch nominal diameter. In nonmetallic conduit less than 2-inch nominal

diameter, pull ropes for wire installation shall be not less than ¼ inch diameter. In nonmetallic conduit of 2-inch nominal diameter or larger, pull ropes for wire installation shall be not less than ½-inch diameter.

Rigid galvanized steel conduit shall be installed at all runs externally attached to structures other than conduit risers.

With the exception of HDPE conduit crossings and associated PVC conduit elbows, the same type of conduit shall be used for the entire length of the run from outlet to outlet. Where PVC or HDPE conduit is used, the same schedule shall be used for the entire length of the run from outlet to outlet.

Where PVC conduit is installed, conduit shall be schedule 40, with the exception that roadway crossings and service lateral runs shall be schedule 80.

Metallic and nonmetallic conduit installation shall include equipment grounding conductor and shall conform to requirements noted in the Standard Plans.

Conduit entering through the bottom of a junction box shall be located near the end walls to leave the major portion of the box clear. At all outlets, conduit shall enter from the direction of the run, terminating six (6) to eight (8) inches below the junction box lid and within 3 inches of the box wall nearest its entry location.

Fittings shall be installed in accordance with the current electrical codes.

Where surface mounting of conduit is required, supports shall consist of stainless steel channel with stainless steel or galvanized 2-hole clamps sized for the conduit. Support spacing shall comply with the National Electric Code or shall be as noted in the contract. Spacing of stainless steel channel supports for conduit shall not exceed five (5) feet. Conduit clamps shall attach to the supports on both sides of the conduit with bolts and associated hardware. The minimum distance between adjacent clamps and between the clamp and the end of the supports shall be one inch. Channel supports shall be installed with stops, to prevent clamps from sliding out of the ends. Channel installations shall provide for future conduit installation. Channel shall be at least one (1) foot longer than required.

Where conduit is surface-mounted, approved expansion, deflection, and/or combination expansion/deflection fittings shall be installed at all expansion joints.

Expansion fittings shall be installed for up to four (4) inches of horizontal movement. Deflection fittings shall be installed for up to ¾-inch movement in all directions. Combination expansion/deflection fittings shall be installed where up to four inches of horizontal movement and ¾-inch of movement in all other directions.

4.4.4.1.1. Surface Mounting Conduit Attachment Components

The Vendor shall provide surface mounting conduit attachment components according to the Standard Specifications. Section 9-29.1 of the Standard Specifications is supplemented with the following:

Fastening hardware components for stainless steel channel supports shall be stainless steel. Conduit clamps shall be 1-piece, 2-bolt units with lock washers.

4.4.4.2. Communication Cables and Interfaces

All locations containing identical components of the same manufacturer, model, and installation configuration shall be configured and wired in an identical manner by the Vendor, including internal wiring and harnesses, wiring color codes, labeling terminal block positions, termination strips, power service configuration, and panel and equipment mounting and locations.

4.4.4.2.1. Conductors, Cable

The Vendor shall provide conductors and cables according to the Standard Specifications. Section 9-29.3 of the Standard Specifications is supplemented with the following:

All materials described in this section shall meet or exceed the applicable provisions of the following documents:

a. CFR Title 7, Section 1755.900, **RUS** Specification for Filled Fiber Optic Cables.

b. ANSI, C8.47-1983, American National Standard for Polyolefin-insulated Thermoplastic Jacketed Communication Cables.

c. Telecommunications Industry Association / Electronic Industries Alliance (TIA/EIA)-455-28-C, Method for Measuring Tensile Failure Point of Optical Waveguide Fibers.

d. TIA/ElA-455-34-A, Interconnection Device Insertion Loss Test.

e. TIA/EIA-455-95-A, Absolute Optical Power Test for Optical Fibers and Cables.

f. EIA-598-B, Color Standard for Optical Fibers.

4.4.4.2.2. Twisted Pair (TWP) Cable

The TWP outer jacket shall be marked with the manufacturer’s name, the year of manufacture, and sequential meter marks. The markings shall be repeated every one meter. The actual length of the cable shall be within +/- 0.1% of the length marking. The marking shall be in contrasting color to the jacket. The marking shall be 2.5mm in height and shall be permanent and weatherproof.

4.4.4.2.3. Fiber-Optic Cable

The Vendor shall provide fiber-optic cable according to the Standard Specifications. Section 9-29.3(1) of the Standard Specifications is supplemented with the following:

The Vendor shall provide manufacturer's certification that the submitted cable shall comply with the Rural Utilities Service (RUS) Specification 1755.900 as currently amended and with the requirements set forth in this Special Provision.

The fiber-optic cable outer jacket shall be marked with the manufacturer's name, the year of manufacture, the words OPTICAL CABLE and sequential meter marks. The markings shall be repeated every one meter. The actual length of the cable shall be within +/- 0.1% of the length marking. The marking shall be in contrasting color to the jacket. The marking shall be 2.5mm in height and shall be permanent and weatherproof.

4.4.4.2.3.1. Singlemode Optical Fibers

The Vendor shall provide singlemode optical fibers according to the Standard Specifications. Section 9-29.3(1)A of the Standard Specifications is supplemented with the following:

Optical fiber shall meet the requirements of ITU G652 and specifically meet ITU G652.D Attributes. The fibers shall support the transmission of wavelengths for Coarse Wavelength Division Multiplexing as defined in ITU G694.2.

4.4.4.2.3.2. Fiber-Optic Cable Labeling

The Vendor shall label fiber-optic cable according to the Standard Specifications. Section 8-20.3 of the Standard Specifications is supplemented with the following:

The Vendor shall identify all fiber optic cable at all terminals, and whenever the cable is entering or leaving a vault, junction box, housing, or enclosure.

4.4.4.2.3.3. Fiber-Optic Cable Installation

Fiber-optic cables shall be installed in continuous lengths without intermediate splices throughout the Project as approved in writing by WSDOT.

The Vendor shall comply with the cable manufacturer's specifications and recommended procedures including, but not limited to the following:

a. Installation.
b. Proper attachment to the cable strength elements for pulling during installation.
c. Bi-directional pulling.
d. Cable tensile limitations and the tension monitoring procedure.
e. Cable bending radius limitations.

The Vendor shall protect the loops from tangling or kinking. At no time during the length of the Project shall the cable's minimum bending radius specification be violated.

Damage to the cable from any source which exceeds the manufacturer's recommended tensile strength limits or cable-bending radius is cause for the cables to be rejected.

The Vendor shall use lubricants during cable-pulling operations, in accordance with the Special Provisions. The lubricants shall be compatible with cable insulation materials, and shall not deteriorate the cable insulation.

4.4.4.3. Electrical Systems and Electronic Cable

The Vendor shall not splice electric or electronic cables without the WSDOT Electrical Inspector's approval. The Vendor shall use 1-piece cables between termination points for power, communications control, and **RF** cables.

When using crimp-on connectors, the Vendor shall install the insulation of electrical cables deep enough into the lug so that the insulation acts as a strain relief.

The Vendor shall maintain the electrical continuity of the cable shields. The Vendor shall comply with Section 3.3 of the United States Department of Agriculture Rural Utilities Service (RUS) Splicing Standard PC-2 for shield bonding. The Vendor shall use bonding connectors complying with RUS standard PE-33 (Cable Shield Connectors).

4.4.4.3.1. Wiring

The Vendor shall provide wiring system according to the Standard Specifications. Section 8-20.3(8) of the Standard Specifications is supplemented with the following:

At each junction box, all power supply wires, and communication cable shall be labeled with a **PVC** marking sleeve. For power supply circuits the sleeve shall bear the circuit number.

All splices shall be made in the presence of the Engineer.

4.4.4.3.2. Bonding, Grounding

The Vendor shall install a grounding system and protection devices that are suitable for the specific installation and equipment being supplied, in accordance with Section 8-20 of the Standard Specifications, and Standard Plan J-9a.

The Vendor shall ground and bond equipment according to the Standard Specifications. Section 8-20.3(9) of the Standard Specifications is supplemented with the following:

In addition to the conductors called for in the Contract, all ITS conduits without innerduct shall be installed with an equipment-grounding conductor and bonding jumpers sized per NEC 250-122, with the exception that the minimum size shall be 8 **AWG**.

All new and existing junction boxes, cable vaults and pull boxes that an equipment-grounding conductor is pulled to shall be bonded in accordance with Section 8-20.3(9) of the Standard Specifications.

4.4.4.3.3. Amplifier, Transformer and Terminal Cabinets

The Vendor shall provide amplifiers, transformers, and terminal cabinets according to the Standard Specifications. Section 9-29.25 of the Standard Specifications is supplemented with the following:

Cabinets shall be fabricated from 0.125-inch sheet aluminum (5052 alloy) with mill finish. Cabinets shall not be anodized and the exterior shall not be painted.

Cabinet door hinges shall meet the requirements for the alternate hinge detailed on Standard Plan J-3b. Doors less than three (3) feet in height shall have two (2) hinges. Doors from three (3) feet to four (4) feet eight (8) inches in height shall have three (3) hinges. Spacing of hinges for doors greater than four (4) feet eight (8) inches in height shall not exceed fourteen (14) inches center to center.

Three (3) point latches are not required for terminal cabinets.

A green construction core shall be installed at each core lock. Upon System Acceptance, two (2) master keys for each cabinet shall be delivered to the **WSDOT Project Manager**.

4.5. Generators

The generator's routine test cycle shall be reviewed and approved by WSDOT before the generator is installed. Any changes to the generator's routine test cycle shall be reviewed and approved by WSDOT. The Vendor shall notify WSDOT at least one (1) week before any testing of the generator is performed during the installation or maintenance segment of Work.

4.6. Environmental Considerations

The Vendor shall conduct all Work necessary to deliver the Project while protecting and enhancing the environment. Elements of the Work shall include, but are not limited to, the following:

a. Avoiding impacts to the community and to environmental, historic, archaeological, and cultural resources beyond those already approved by the regulatory agencies. If impacts are unavoidable, the Vendor shall make every effort to minimize the unavoidable impacts. New, unavoidable impacts shall be mitigated.

b. Fostering good relationships with **Federal**, State, and local agencies; tribes; and local stakeholders by ensuring that the commitments WSDOT has made are reflected in the Project's final design and are fulfilled during construction. The Vendor shall accomplish this by meeting or exceeding all **Environmental Requirements** and commitments listed in the Contract, **Permits**, environmental documents, regulatory agency permits, and regulatory agency Concurrence Letters.

c. Complying with all Federal, State, and local laws, regulations, and ordinances (collectively referred to in this section as "regulations") and not receiving any permit violations, complying with all Federal, State, and local laws, regulations, and ordinances (collectively referred to in this section as "regulations") and not receiving any penalties or warnings from resource agencies for permit violations.

4.6.1. Environmental Compliance Plan (ECP)

4.6.1.1. Documentation and Approval

The Vendor shall prepare and implement an Environmental Compliance Plan (ECP) that identifies roles and responsibilities of Key Project Staff, procedures for environmental compliance, procedures to identify and correct non-compliance events, and procedures for emergency Key Project Staff. WSDOT's goal is to ensure environmental compliance with no permit violations.

The Vendor shall provide WSDOT with a complete ECP thirty (30) Calendar Days prior to the start of installation. The Environmental Compliance Manager (ECM) shall be responsible for submitting the ECP for WSDOT review. The ECP shall be consistent with all other requirements of the Quality Management Plan (**QMP**).

The ECP shall consist of two parts:

a. Part I: Environmental Personnel, Communications, and Training
b. Part II: Environmental Plans and Strategies

The Final ECP shall be stored in a format easily accessible by WSDOT and the regulatory agencies. A hard copy of the ECP shall be maintained by the ECM on-site at the Project.

4.6.1.2. Environmental Personnel, Communications, and Training

4.6.1.2.1. Environmental Compliance Manager (ECM)

The Vendor's Project Manager or his designee as approved by WSDOT shall serve as the ECM for this Project. The ECM shall be responsible for overall environmental compliance for the Project, and shall function as principal technical advisor and coordinator for environmental issues. The ECP shall identify all critical roles, responsibilities, and authorities of the ECM. The ECP shall identify the roles and responsibilities of other staff, and their roles in assuring environmental compliance. The ECP shall identify how the ECM will interact with WSDOT's Environmental Compliance Assurance Inspector (ECAI), as WSDOT's ECAI will be performing compliance audits and will be working closely with the ECM.

The ECM must have recent experience managing environmental design and construction compliance issues on projects.

The ECM shall also be responsible for the following:

a. Advising how to avoid and minimize adverse effects to the natural environment and communities.
b. Ensuring the Project's design reflects environmental commitments and requirements
c. Ensuring and providing documentation that the Work complies with all environmental commitments agreed to in the environmental documents, Permits, agreements, and approvals of the Project.

d. Identifying when non-compliance is occurring or has occurred.

e. Ensuring that environmental compliance measures and Best Management Practices are meeting Environmental Requirements.

4.6.1.2.2. Environmental Communications Protocol

As part of the ECP, the ECM shall develop, document, and implement an Environmental Communications Protocol. The Environmental Communications Protocol shall describe the process to be used for non-compliance reporting; procedures for internal and external communications; and communications with WSDOT. When developing the Environmental Communications Protocol, the Vendor shall ensure the procedures are consistent with the WSDOT *Environmental Compliance Assurance Procedure*.

The Environmental Communications Protocol shall include organizational charts that identify the Vendor's ECM and other personnel who will be assisting the ECM to ensure compliance with all permit conditions, performance standards, and environmental commitments. It shall discuss the personnel's roles and communication procedures that will be used for the internal and external communications, and communications with WSDOT.

4.6.1.2.2.1. Internal Communications

For internal communications procedures, the Vendor shall:

a. Describe the Vendor's organizational hierarchy and identify compliance roles and internal reporting responsibilities;

b. Include a clear discussion regarding which Key Project Staff, in addition to the ECM, have the authority to stop Work on the Project to prevent a violation from occurring; and

c. Describe the process for identifying and reacting to non-compliance events.

4.6.1.2.2.2. External Communications

For external communications procedures, the Vendor shall describe a procedure that defines how all external communications received by the Vendor will be documented and handled, including how WSDOT will be involved. External communications may originate from tribes, local jurisdictions, regulatory agencies, and the public. Issues may range from public noise complaints to violation notices from regulatory agencies. Where appropriate, this communication procedure shall be consistent with the WSDOT *Environmental Compliance Assurance Procedure*, and all permit conditions, performance standards, environmental commitments, and regulations. WSDOT will remain the main point of contact (unless the Vendor is otherwise directed by WSDOT) for coordination with tribes, local jurisdictions, the public, and regulatory agencies; and will be responsible for external notifications and reporting non-compliance events or spills to the relevant agencies.

4.6.1.2.2.3. WSDOT Communications

For communications with WSDOT, the Vendor shall:

a. Describe interactions between the Vendor and WSDOT in regard to reporting non-compliance issues.

b. Identify all applicable WSDOT personnel that would be contacted in the event of a spill or non-compliance event. The Vendor shall ensure the procedure is consistent with the WSDOT Environmental Compliance Assurance Procedure.

c. Describe the Vendor's communication process and Key Project Staff who would be responsible for recognizing when a design change and/or alternative construction technique may require a Permit modification or new approval. This section shall describe the Vendor's strategy for managing design changes that may require permit modifications or additional approvals.

4.6.1.2.3. Environmental Protection Training

The Vendor shall develop and implement an environmental protection training program for the Vendor's design and construction staff, Quality Assurance personnel, and Subcontractors. The Vendor shall be responsible for these personnel should their work practices lead to a negative effect on the environment, or result in a non-compliance event or permit violation. Therefore, the Vendor's training program shall orient employees and Subcontractors to the following activities prior to the start of construction:

a. Permit conditions, performance standards, environmental commitments, and environmental regulations related to the Project;

b. The overall importance of environmental issues;

c. The specific environmental sensitivities of the Project;

d. Environmental compliance monitoring and reporting procedures;

e. Emergency Key Project Staff procedures.

The Vendor's ECM shall notify WSDOT of environmental training sessions and invite WSDOT to participate.

4.6.1.3. Spill Prevention, Control, and Countermeasures (SPCC) Plan

The Vendor shall prepare a Project-specific SPCC Plan that will be used for the duration of the Project. The Vendor shall submit the Plan to WSDOT as part of the ECP in accordance with the requirements described in this section. No on-site construction activities may commence until WSDOT accepts an SPCC Plan for the Project.

The term "hazardous materials", as used in these requirements, is a generic term for any medium that contains organic or inorganic constituents considered toxic to humans or the

environment. This term includes dangerous waste, problem waste, petroleum product, and hazardous substances. Occupational safety and health requirements that may pertain to SPCC Plan implementation are contained in but not limited to chapter 296-824 and chapter 296-843 of the **WAC**.

4.6.1.3.1. Implementation Requirements

The SPCC Plan shall be updated by the Vendor throughout Project construction so that the written Plan reflects actual site conditions and practices. All Project employees shall be trained in spill prevention and containment, and shall know where the SPCC Plan and spill Key Project Staff kits are located and have immediate access to them.

If hazardous materials are encountered or spilled during construction, the Vendor shall do everything possible to control and contain the material until appropriate measures can be taken. The Vendor shall supply and maintain spill Key Project Staff kits of appropriate size within close proximity to hazardous materials and equipment.

The Vendor shall implement the spill prevention measures identified in the SPCC Plan before performing any of the following:

a. Placing materials or equipment in staging or storage areas;
b. Refueling, washing, or maintaining equipment; or
c. Stockpiling contaminated materials.

4.6.1.3.2. SPCC Plan Element Requirements

The SPCC Plan shall set forth the following information in the following order:

a. Responsible Personnel

   Identify the name(s), title(s), and contact information for the personnel responsible for implementing and updating the plan, including all spill responders.

b. Spill Reporting

   List the names and telephone numbers of the Federal, State, and local agencies the Vendor shall notify in the event of a spill.

c. Project and Site Information

   Describe the following items:

   i. The Project Work.
   ii. The site location and boundaries.
   iii. The drainage pathways from the site.
   iv. Nearby waterways and sensitive areas and their distances from the site.

d. Potential Spill Sources

Describe each of the following for all potentially hazardous materials brought or generated on-site (including materials used for equipment operation, refueling, maintenance, or cleaning):

i. Name of material and its intended use.

ii. Estimated maximum amount on-site at any one time.

iii. Location(s) (including any equipment used below the ordinary high water line) where the material will be staged, used, and stored and the distance(s) from nearby waterways and sensitive areas.

iv. Decontamination location and procedure for equipment that comes into contact with the material.

v. Disposal procedures.

e. Pre-Existing Contamination

Describe any pre-existing contamination and contaminant sources (such as buried pipes or tanks) in the Project area that are described in the Contract documents. Identify equipment and work practices that will be used to prevent the release of contamination.

f. Spill Prevention and Response Training

Describe how and when all personnel (including refueling contractors and Subcontractors) will be trained in spill prevention, containment and Key Project Staff in accordance with the Plan. Describe how and when all spill responders will be trained in accordance with WAC 296-824.

g. Spill Prevention

Describe the following items:

i. Spill Key Project Staff kit contents and location(s).

ii. Security measures for potential spill sources.

iii. Secondary containment practices and structures for hazardous materials.

iv. Methods used to prevent stormwater from contacting hazardous materials.

v. Site inspection procedures and frequency.

vi. Equipment and structure maintenance practices.

vii. Daily inspection and cleanup procedures that ensure all equipment used below the ordinary high water line is free of all external petroleum based products.

viii. Refueling procedures for equipment that cannot be moved from below the ordinary high water line.

h. Spill Response

Outline the Key Project Staff procedures the Vendor will follow for each scenario listed below. Include a description of the actions the Vendor shall take and the specific, on-site, spill Key Project Staff equipment that shall be used to assess the spill, secure the area, contain and eliminate the spill source, and clean up and dispose of spilled and contaminated material.

i. A spill of each type of hazardous material at each location identified in 4, above.

ii. Stormwater that has come into contact with hazardous materials.

iii. A release or spill of any pre-existing contamination and contaminant source described in 5, above.

iv. A release or spill of any unknown pre-existing contamination and contaminant sources (such as buried pipes or tanks) encountered during Project Work.

v. A spill occurring during Work with equipment used below the ordinary high water line.

If the Vendor will use a Subcontractor for spill Key Project Staff, provide contact information for the Subcontractor under item 1 (above), identify when the Subcontractor will be used, and describe actions the Vendor shall take while waiting for the Subcontractor to respond.

i. Project Site Map

Provide a map showing the following items:

i. Site location and boundaries.

ii. Site access roads.

iii. Drainage pathways from the site.

iv. Nearby waterways and sensitive areas.

v. Hazardous materials, equipment, and decontamination areas identified in 4, above.

vi. Pre-existing contamination or contaminant sources described in 5, above.

vii. Spill prevention and Key Project Staff equipment described in 7 and 8, above.

j. Spill Report Forms

Provide a copy of the spill report form(s) that the Vendor will use in the event of a release or spill.

4.6.2. NEPA/SEPA Documentation

A NEPA Environmental Assessment (EA) has been prepared by WSDOT to address the scope, impacts, and mitigation for the Project. In addition, the EA has been adopted as the documentation for a SEPA Determination of Non-significance (DNS) by WSDOT. Both the NEPA EA and the SEPA DNS can be found at http://www.wsdot.wa.gov /Projects/LkWaMgt/library.htm. If the design of the Project is altered by the Vendor in such a way that causes new or additional impacts to the environment and/or surrounding communities, revised or supplemental NEPA/SEPA documentation may be required. If required, the Vendor shall be responsible for preparing any additional environmental documentation. In addition, the Vendor shall pay all costs and accept all responsibility for any schedule delays associated with securing the additional environmental approvals.

If required, the environmental re-evaluation shall follow the WSDOT Environmental Procedures Manual and 23 CFR 771. WSDOT will coordinate with all previously-involved agencies as part of any re-evaluation process. Final determination regarding the necessity of environmental re-evaluations shall be made by WSDOT and the FHWA.

All environmental re-evaluations shall be subject to written approval by WSDOT and FHWA.

4.6.3. Permits and Approvals

WSDOT will obtain the following Permits and approvals:

a. Coastal Zone Management Act Consistency Determination – Ecology

The Vendor shall acquire the following Permits and approvals (if necessary) and comply with all associated Environmental Requirements. Other Permits may be required.

b. Noise Variance – City of Medina

4.6.4. Other Agreements and Commitments

4.6.4.1. Noise

The Vendor shall implement mitigation measures for temporary noise impacts associated with construction activities in accordance with the noise variances. The Vendor shall obtain a noise variance from the local jurisdiction, as required, and shall comply with all conditions within the variance.

The Vendor should be aware that the process to obtain noise variances can be lengthy, and should plan to submit the noise variance applications as soon as practicable. WSDOT will be available as a resource if the Vendor requests assistance during the variance approval process.

4.6.4.2. Threatened and Endangered Species

An Endangered Species Act (ESA) No Effect letter was issued and is included as Appendix 17.2.

If the Vendor modifies design or construction activities beyond those agreed to in the No Effect Letter, ESA consultation may have to be initiated. If this occurs, the Vendor shall work through WSDOT to provide the necessary information required for ESA consultation. If ESA consultation needs to be reinitiated due to changes made by the Vendor, all cost and schedule impacts shall be the Vendor's responsibility.

4.6.4.2.1. Nesting Migratory Birds

Nesting migratory birds may be found on bridges within the Project area. WSDOT will inform the Vendor as to the location of nesting migratory birds as it becomes aware of them. The Vendor shall immediately notify WSDOT if it encounters previously unidentified nesting birds within the Project area and stop Work until a WSDOT biologist can assess the situation. WSDOT will perform this assessment with 1 Working Day of notification. In the vicinity of nesting migratory birds, the Vendor shall meet at least one of the following requirements:

a. Work shall take place above the bridge deck.
b. Work shall take place between July 31st and March 15th.
c. Work shall take place more than fifty (50) feet from a nest and not within line-of-sight of the birds.

4.6.4.3. Hazardous Materials

The east high-rise truss structure is coated with lead based paint. If the Vendor elects to weld, drill, cut into, or disturb any part of the truss structure or to remove any of the paint for any reason, the Vendor shall prepare a Project-specific Lead Based Paint Containment and Disposal Plan. The Vendor shall submit the Plan to WSDOT as part of the ECP in accordance with the requirements described in this section. No on-site construction activities that disturb lead based paint may commence until WSDOT accepts a Lead Based Paint Containment and Disposal Plan for the Project.

The Lead Based Paint Containment and Disposal Plan must describe how the Vendor shall contain the disturbed paint and any associated debris, including any abrasive blasting debris, ensure proper testing and designation of the paint and debris, dispose of the paint and debris appropriately, and provide WSDOT with documentation of the disposal.

The Vendor shall ensure that the site is properly contained during construction so that containments are not released to the environment and that the health and safety of all on-site personnel are protected during work at the site.

If unknown contamination is discovered during construction, the Vendor shall notify WSDOT immediately and shall follow the SPCC Plan as well as all appropriate regulations.

4.6.4.4. Worker and Public Health and Safety

The Vendor shall comply with the following regulations and agreements:

a. State Dangerous Waste Regulations (Chapter 173-303 WAC);

b. Safety Standards for Construction Work (Chapter 296-155 WAC);

c. Washington Industrial Safety and Health Act (Chapter 49.17 RCW);

d. National Emission Standards for Hazardous Air Pollutants (NESHAP) (Code of Federal Regulations, Title 40, Volume 5, Parts 61 to 71);

e. General Occupational Health Standards (Chapter 296-62 WAC); and

f. Implementing Agreement Between Ecology and WSDOT Concerning Hazardous Waste Management.

4.6.4.5. Historic, Archaeological, and Cultural Preservation

WSDOT has determined that the Evergreen Point Bridge, including the east high-rise truss structure, is eligible for the National Register of Historic Places. WSDOT has found that this Project will have no significant impact and no adverse effect on this historic property under the regulations implementing the National Historic Preservation Act of 1966 (36 CFR 800.5) as described in the Cultural Resources Technical Memorandum (Appendix 17.1).

If the Vendor elects to propose a design change that substantially differs from the design analyzed in the Cultural Resources memorandum a subsurface investigation and consultation with the Department of Archaeology and Historic Preservation and affected and interested tribes may be necessary. WSDOT reserves the right to take up to thirty (30) Calendar Days to provide concurrence for the proposed design change. WSDOT will use this time to coordinate with outside agencies, tribes, and other entities, and/or to complete field investigations.

4.7. Over-the-Shoulder Review

As part of WSDOT's oversight role, all materials and each part or detail of the Work may be subject to WSDOT inspection and verification testing. The over-the-shoulder inspection shall be performed at a frequency that is targeted at ten (10) percent of the **QA** staff testing frequency, but shall be established at WSDOT's sole discretion to verify the accuracy of:

a. The procedures and techniques of testing

b. The equipment used by the QA staff's personnel

c. The QA staff's test results

If WSDOT is not given adequate notice and the opportunity for prior inspection of any Work done or materials used, then WSDOT may order that such Work or materials be uncovered, removed or restored at the Vendor's expense, and the Vendor shall not be entitled to a time extension, even if the Work proves to conform with the requirements of the Contract, the Governmental Approvals, and applicable Law after uncovering.

5. TESTING AND SYSTEM ACCEPTANCE

5.1. Master Test Plan

The Vendor shall prepare a detailed Master Test Plan for testing all components of the TCS. This plan shall include environmental certification, functional tests, performance tests, and all other tests. The Vendor shall submit a written report documenting the results for all tests performed and comparing them to the expected results.

Tentative dates for conducting the various tests shall be included in the Master Test Plan, as submitted by the Vendor. Reasonable modifications to these dates may be permitted during the course of the Work provided a written request for such changes is made at least two (2) weeks prior to the revised test date and approved by WSDOT.

The Master Test Plan shall define the following Segment of Work #1 Tests:

a. Factory Acceptance Test. The Vendor shall perform a Factory Acceptance Test following the approval of the Final System Design Document to demonstrate that the System can perform as required in the factory setting. The Vendor shall complete Factory Acceptance Tests within a factory or Software development lab in order to ensure that all the required functionality of the Hardware and Software has been met.

b. Commissioning Testing. Commissioning Testing shall commence with a series of baseline test procedures to demonstrate core functionality in an unambiguous fashion.

c. Interface Control Testing: Interface Control Testing shall demonstrate full "end-to-end" functionality from the TCS through to the CSC. Interface Control Testing shall occur after Commissioning Testing and prior to System Acceptance.

d. Operational Testing. The Test Plan shall define procedures for evaluating the System in a real-world environment. The Operational Test is to be conducted and evaluated by the Vendor. The Operational Testing Procedures shall include, but not necessarily be limited to, the following:

    i. Review of recorded **Transaction** data to identify any patterns that suggest erratic or faulty system behavior. Such indications may prompt further analysis or investigation.

    ii. Review of **MOMS** and other maintenance data to identify reliability problems.

    iii. Controlled testing through the insertion of test vehicles into real traffic.

The Master Test Plan shall define the following Segment of Work #2 Test:

a. Performance Audit. The Test Plan shall define controlled test procedures for evaluating the System on an annual basis to ensure that System reliability and accuracy has not degraded over time and the Toll Zone Systems continue to satisfy the functional and performance requirements. Procedures shall be similar to those defined for Operational Testing. The Vendor shall also incorporate selected WSDOT ad hoc tests into the Performance Audit test procedures.

With the exception of the Factory Acceptance and Commissioning Tests, the Vendor shall utilize live, uncontrolled traffic when testing the performance of the TCS. Test vehicles may be mixed into the **Live Traffic** although the results may only be used for verification and not part of the sample data.

5.1.1. Factory Acceptance Test (FAT)

The FAT shall be conducted to verify that all functional elements of the TCS and components provided by the Vendor under this Contract are in conformance with WSDOT's technical and operational requirements specified in this appendix and the Final System Design as accepted by WSDOT.

The FAT shall be conducted for the entire TCS to include tests of both the Hardware and the **FMAS**. The FAT shall be conducted either at the Vendor's facility in actual lanes or at a facility designated by WSDOT in accordance with the accepted Master Test Plan and test procedures.

WSDOT shall be allowed to witness the FAT, and the Vendor shall have the responsibility to perform the FAT. The FAT shall provide sufficient confidence to WSDOT, in its sole determination, that the Vendor's System meets WSDOT operational requirements, standard and performance criteria, and is ready to be installed on-site.

The Vendor shall provide the required support personnel; test vehicles, test equipment and test environment, and testing shall be conducted in accordance with the Project Schedule and Approved Test Procedures.

Upon completion of the FAT, the Vendor shall submit a test report that details the results of the test. Upon the Acceptance of the FAT by WSDOT, the Vendor shall be given the authorization to move forward to the Commissioning Test.

5.1.1.1. Hardware

All Hardware provided by the Vendor shall be unit tested to ensure it complies with the requirements set forth in the Contract. The Vendor shall verify that each component meets the Approved Design Specifications.

The Vendor shall also provide certification that the Hardware provided under this Contract meet the requirements for the environmental conditions identified within this document.

5.1.1.2. FMAS

The functionality of the FMAS, including MOMS, shall be tested as part of the FAT using the data generated from test vehicles or automated test scripts.

The data management functionality, specifically the toll rate, toll schedule, and user management shall be tested.

All screens shall be tested for windows and standard actions compliance, aesthetics conditions, validation conditions, navigation conditions, usability conditions, data integrity conditions, modes conditions, field validations, and adherence to requirements.

The MOMS functionality shall be verified and the System's ability to page technicians shall be tested.

5.1.2. Commissioning Test

During the Commissioning Test, the processing of Toll Transactions shall verify that no information is missing and validate related business rules for the data (i.e., automatic operations in the application to check for duplicates and/or check the toll rates on Transactions). Exceptions shall be flagged and provisions to modify Transactions as data errors are detected shall be provided. A permanent log of modifications shall be maintained in the database for future queries.

All functional requirements are to be verified as being satisfied by the Vendor's Toll Zone System. The Test Plan shall provide a matrix listing each requirement and how that requirement is to be tested or demonstrated, by inspection, analysis, or test. For those requirements that are to be verified through testing, the matrix shall outline the particulars such as the conditions of the test and the number of test runs planned in addition to the method of verification. Conditions of the test shall include items such as lighting, type of vehicle, and the speed and movement of the vehicles through the Toll Zone (left to right, straddling lanes, vehicle speed, and mix of vehicles with and without tags). The primary TCS Commissioning Testing shall include correlation testing where platoons of closely spaced vehicles, some with and some without tags and the System correctly identifies and captures images of the vehicles without **Transponders**. This identification shall be accomplished without recourse to the use of license plate numbers of the test vehicles.

Upon completion of the Commissioning Test, the Vendor shall submit a test report that details the results of the test. Upon acceptance of the Commissioning Test by WSDOT, the Vendor shall be given the authorization to move forward to the Interface Control Test.

5.1.3. Interface Control Tests

The Vendor shall demonstrate that the TCS provided by the Vendor is in compliance with the requirements within this document and its functionality complies with the operational requirements and the accepted Design documents.

The Vendor shall coordinate with WSDOT and the CSC Vendor and perform the TCS-CSC interface test to verify and validate the successful transfer of Transactions (both Transponder and image based) from the FMAS to the CSC.

The FMAS interface to the CSC shall be tested in accordance with the accepted **Interface Control Documents** (**ICD)**. The functionality and interface with the **SIMMS** shall be tested in accordance with the accepted ICDs.

Upon completion of the Interface Control Test, the Vendor shall submit a test report that details the results of the test. Upon the Acceptance of the Interface Control Test by WSDOT, the Vendor shall be given the authorization to move forward to the Operational Test.

5.1.4. Operational Test

The Operational Test shall be conducted under live operational conditions, including but not limited to actual traffic, maintenance calls, and system interfaces. The Operational Test shall begin following certificate of Operational Readiness as defined in Appendix 2. The Vendor shall operate the TCS for thirty (30) consecutive Calendar Days showing the System meets performance requirements ID 1 through 7 in Exhibit A.

Upon successful completion of the Operational Test, the Vendor shall submit to WSDOT an Operational Test Completion letter, which describes the results of the Operational Test.

5.1.4.1. Operational Test Report

Within thirty (30) Calendar Days of successful completion of the Operational Test, the Vendor shall submit an Operational Test Report, which describes the results of the Operational Test.

The purpose of the Operational Test Report is to document that the System can accurately operate and collect tolls, monitor operations and maintenance functions, and report on the System functionality and maintenance activities for at least thirty (30) Calendar Days under live conditions.

5.2. Test Procedures

Vendor shall prepare detailed Test Procedures for all tests with respect to the functional requirements detailed in this document. The Test Procedures shall cover test set-up, step-by-step procedures for controlled tests, and the expected results for each step.

Tests shall be “end-to-end” so that results are tracked through the System, whenever possible. For example, the impact of parameter changes observed in the behavior of the lane systems or results of tests that are conducted in the lanes shall be tracked at the FMAS. WSDOT shall arrange for reports of the transmitted test Transactions and video images to be processed by the FMAS and provided to the Vendor.

The following are illustrative of the aspects of the System that shall be demonstrated in the tests:

a. Power up tests
b. Verify initialization
c. Verify data integrity (no loss of data)
d. Verify diagnostic messages
e. Introduce failures
f. Verify diagnostic messages
g. MOMS reporting
h. Normal Transaction tests
i. Lane Operational Tests
j. Functioning of the FMAS and interface to the CSC
k. Various vehicle speeds up to 100 mph
l. Varying light conditions
m. Correct identification of photo tolled vehicles within a platoon of vehicles
n. Proper association of vehicle and Transponder
o. Proper association of vehicle and license plates
p. Platoons of closely spaced vehicles with a mix of tagged and untagged vehicles and vehicles of various types
q. Toll Zone stand-alone operation tests

5.3. Test Scheduling

The Vendor shall notify WSDOT in writing at least seven (7) Calendar Days prior to commencing planned testing activities, to allow WSDOT to schedule its resources. In addition, the Vendor shall notify WSDOT in writing by noon (Pacific Time) on Friday of all scheduled testing activities for the following week. The Vendor shall give WSDOT at least a fourteen (14) Calendar Day written notice for testing-related activities occurring more than sixty (60) miles from the Project. In each case, the Vendor shall describe the specific locations at which the testing activities shall occur, as well as general description of the activities to take place.

Failure to provide WSDOT with adequate notice as specified above may result in WSDOT withholding a portion of the Vendor's Milestone payment(s).

5.4. Limitations of Testing Operations

Testing operations shall be conducted in a manner and sequence that assures the least interference with traffic, with due regard to the location of detours and provisions for handling traffic.

Fourteen (14) Calendar Days prior written notice shall be given to WSDOT before night Work is started and will only be allowed if adequate lighting is provided for performing satisfactory testing and safe operations. The Vendor shall be responsible for coordinating all nighttime activities.

5.5. System Acceptance

Upon the successful completion of all System tests, closure of all punch-list items, completion, submission, and approval of all required documents and meeting of other conditions as specified in these requirements and the Contract including the submission and approval of the Operational Test Report, the Vendor shall be given System Acceptance.

* * * End of Appendix * * *